

CAN
824

212

HARVARD UNIVERSITY



LIBRARY

OF THE

Museum of Comparative Zoölogy

The CANADIAN FIELD-NATURALIST

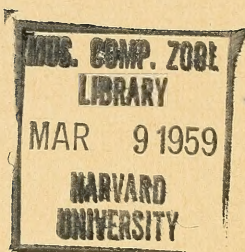
Volume 73
1959



THE OTTAWA FIELD-NATURALISTS' CLUB

OTTAWA

ONTARIO



S-6212

LIBRARY
MAR 9 1959
HARVARD
UNIVERSITY

The CANADIAN FIELD-NATURALIST

Published by THE OTTAWA FIELD-NATURALISTS' CLUB, Ottawa, Ontario

Articles

Hand-Reared Mallard Releases in the Maritime Provinces	GEORGE F. BOYER	1
Bird Observations at Tahsis Inlet, Vancouver Island	GEORGE J. MITCHELL	6
Records of Marine Fishes from Fresh Water in British Columbia	DON E. McALLISTER	13
Observations on Marine Birds off Southwestern Nova Scotia	DAVID M. SCOTT	15
Migrations of Caribou in Wells Gray Park, British Columbia	R. YORKE EDWARDS and RALPH W. RITCEY	21
Elytral Pattern Distribution in <i>Chrysomela aeneicollis</i>	WALTER ROBERT HENSON	26

Reports

Christmas Bird Census—1958	29
Annual Report, Ottawa Field-Naturalists' Club, December 4, 1958	47
Financial Statement, Ottawa Field-Naturalists' Club, 1958	51

Notes

Beetles as Parasites of Mammals	WALTER SHEPPE	52
Revision of Some Triassic Ammonoids, Peace River Foothills	FRANK H. McLEARN	53
Flowering Rush in Nova Scotia	IVAN VICTOR HALL	53
The Gray Fox, a Manitoba Record	RICHARD W. SUTTON	54
Mandt's Black Guillemot, Hudson Bay	H. G. LUMSDEN	54

Reviews

Algae, the Grass of Many Waters — Comparative Biosystematics and Life History of the Nuthatches — Birds of Maryland and the District of Columbia — Spring Flowers of the Lower Columbia River — Mammals of Banks Island — A Guide to the Aging of Pheasant Embryos — Geology of the Great Lakes — Investigations of Ring-necked Pheasants in Illinois — Symbolism in Flower Arrangement — A Guide to Saskatchewan Mammals — Variation and Systematic Relationships within the Salamander Genus <i>Taricha</i> — Animal Tracks and Hunter Signs.	55
---	----

THE OTTAWA FIELD-NATURALISTS' CLUB

FOUNDED IN 1879

The objects of the club are to foster an acquaintance with and a love of nature, to encourage investigation and to publish the results of original research and observations in all branches of natural history. The patron is His Excellency, the Right Honorable Vincent Massey, C.H., Governor General of Canada. The club is a corporate member of the Federation of Ontario Naturalists.

MEMBERS OF COUNCIL

EDWARD L. BOUSFIELD, *President*, National Museum of Canada, Ottawa, Ontario

W. WINSTON MAIR, *First Vice-President*

DONALD R. BECKETT, *Second Vice-President*

JOHN M. GILLET, *Treasurer*, Science Service Building, Ottawa, Ontario

A. W. FRANK BANFIELD, *Secretary*, National Museum of Canada, Ottawa, Ontario

I. L. CONNERS, C. FRANKTON, *Auditors*

MRS. JOHN W. ARNOLD, MISS ANNE BANNING, MISS CHARLOTTE DILL, MRS. JOHN HAWKSBRIDGE, MISS VIOLET HUMPHRIES, MISS PAULINE SNURE, THE REVEREND F. E. BANIM, MESSRS. J. W. ARNOLD, W. K. W. BALDWIN, D. R. BECKETT, B. BOIVIN, A. E. BOURGUIGNON, K. BOWLES, A. W. CAMERON, W. J. CODY, I. L. CONNERS, C. FRANKTON, R. FRITH, W. E. GODFREY, H. GROH, J. W. GROVES, R. A. HAMILTON, W. I. ILLMAN, H. LLOYD, C. R. PATTERSON, A. E. PORSILD, L. S. RUSSELL, D. B. O. SAVILLE, H. J. SCOGGAN, G. W. SINCLAIR, V. E. F. SOLMAN, J. S. TENER.

THE CANADIAN FIELD-NATURALIST

Science Service Building, Ottawa, Ontario

ROBERT A. HAMILTON, *Editor*

W. J. CODY, *Business Manager*

Associate Editors: F. J. ALCOCK (Geology), JOHN W. ARNOLD (Entomology), W. A. BELL (Paleontology), J. SHERMAN BLEAKNEY (Herpetology), AUSTIN W. CAMERON (Mammalogy), WILLIAM G. DORE (Botany), J. R. DYMOND (Ichthyology), W. EARL GODFREY (Ornithology), A. G. HUNTSMAN (Marine Biology), A. LAROCQUE (Conchology).

The Canadian Field-Naturalist is published quarterly by the Ottawa Field-Naturalists' Club with the assistance of affiliated societies listed on the inside back cover. Manuscripts representing personal observations or the results of original research in any branch of natural history are invited. In the preparation of papers authors should consult the most recent issue and the information for contributors on the inside back cover. Advertising rates and prices of back numbers of this journal and its predecessors, *TRANSACTIONS OF THE OTTAWA FIELD-NATURALISTS' CLUB*, 1879-1886, and the *OTTAWA NATURALIST*, 1887-1919, are obtainable from the business manager.

MEMBERSHIP AND SUBSCRIPTION

The annual membership fee of \$4.00 covers subscription to the journal. Institutions, however, may subscribe at the same rate as that for membership. Single current numbers of regular issues are ninety cents. Money orders should be made payable to the Ottawa Field-Naturalists' Club and sent to the treasurer. Notice of change of address should also be sent to the treasurer.

The Canadian Field-Naturalist

VOLUME 73

JANUARY-MARCH 1959

NUMBER 1

HAND-REARED MALLARD RELEASES IN THE MARITIME PROVINCES

GEORGE F. BOYER

Canadian Wildlife Service, Maple, Ontario

THE Maritime Provinces lie well outside the normal range of the common Mallard *Anas platyrhynchos* but a few are seen there each year. Summer surveys by the Northeastern Wildlife Station showed that in the lower St. John River valley in New Brunswick Mallards averaged only about 0.5 percent of the waterfowl population during the six-year period from 1949 to 1956 (Carter, 1950, 1951, 1952; Reid, 1954; Wright, 1949, 1953). Boyer and Carter in an unpublished report of the Canadian Wildlife Service, 1955, gave a figure of about 0.2 percent for the Maritimes for the spring of 1955.

Local sportsmen have always shown keen interest in the Mallard, and several small-scale attempts have been made to establish it. Unfortunately most of the introductions were haphazard, and records were not kept. This paper deals mainly with a small experiment carried out by the writer, and three other attempted releases that are worthy of consideration.

In the summer of 1928 Guy Humphrey of Hampton, N.B., released 20 adult Mallards that he had purchased the year before, together with an unspecified number of ducklings. As these birds were not banded, their subsequent history cannot be traced accurately. A few Mallards were shot in that locality in the fall of 1928, and there were occasional sightings reported from the general vicinity for several summers.

In May and June, 1941, Mr. John Tingley, a game warden, released 92 Mallards in the vicinity of Sackville, N.B., near the Nova Scotia border. Some of them were banded, and two were subsequently recovered. One was found dead (possibly run over by a train), near Sackville, the following spring. The other was shot at Edgartown, Mass., on November 11, 1942. There were no indications that the introduction persisted longer.

Seventy Mallards were banded and released in the lower St. John River valley during the summer of 1948 by the Northeastern Wildlife Station. As far as the writer knows, none of them has been recovered. Some of the Mallards found annually by the station's survey crews may have been from this introduction.

During the period 1952 to 1955 the writer had an opportunity to carry out a series of releases in the Chignecto Isthmus, which lies on both sides of the border between New Brunswick and Nova Scotia. The birds were donated by Dr. G. M. McFarlane, a resident of Sackville, who was having considerable success in raising Mallards from game-farm stock originally acquired from Delta Research Station in Manitoba. A total of 226 birds was banded and released.

Mailing date of this number: 5 March 1959

THE CHIGNECTO RELEASES

The rearing pond is located in the center of Sackville and although there is some natural food the birds are sustained largely by artificial feeding. As the main enclosure is not covered, the movements of unpinioned birds are not restricted. Several other species of waterfowl are kept, and wild Black Ducks *Anas rubripes* are frequent visitors, especially during the fall and winter.

In the summer of 1952, 55 Mallards were banded and left at the rearing pond to see whether they would leave of their own accord. The following year one of them was shot on the opening day of the hunting season. There is no indication that any of the others left the pond. During the rest of the experiment, the birds were released in waterfowl habitat at a distance varying from six to 30 miles away (Table 1).

TABLE 1. MALLARDS RELEASED IN THE CHIGNECTO ISTHMUS, 1953-1955

Date	Numbers					Place	Miles from Home Pond
	Adult		Immature		Total		
Aug. 19, 1953	18	18	26	19	81	Midgic, N.B.	6 (n.e.)
July 12, 1954	7	10	38	47	102	Amherst Pt., N.S.*	10 (s.w.)
July 30, 1955	2	5	9	16	32	Amherst Pt., N.S.*	10 (s.e.)
July 30, 1955	2	—	2	7	11	Upper Cape, N.B.	30 (s.e.)
Total	29	33	75	89	226		

*Federal Migratory Bird Sanctuary.

The birds were captured and released on a single day each summer. All Mallards on the rearing pond were driven into a small roofed wire enclosure where they were caught with a hand net, banded, and placed in grain sacks for transportation by car to the release area. The ducklings varied in age approximately from five to eight weeks, but as only small numbers were involved, all birds of the year were classed as 'immatures.'

Since the birds released in 1952 showed little inclination to leave the rearing pond, it was of interest to ascertain whether those transported to other areas would retain the attachment. There were few opportunities to visit the rearing pond, but during subsequent banding operations all Mallards were carefully checked and previously banded birds were recorded. Of the 81 birds released in 1953, at a point six miles from the rearing pond (Table 1), seven adults were found on the home pond during the two following years. Three of these were absent from the 1954 check but accounted for in 1955. This might indicate regular movement of some birds from the home pond to some nearby point and back. Of the birds released at a point ten miles away in 1954 (Table 1) only one was found the following year. This was an adult female which had returned in 1954 from the 1953 release. Because no immatures were again seen, it may be assumed that the attachment to the home pond was confined to adults that had lived there one or more years. It may also be inferred that they were somewhat familiar with the general vicinity of Sackville.

Band Recoveries

Up to the end of 1957 there have been 28 band recoveries, or nearly 12 percent of the birds released during the period 1953 to 1955 (Table 2).

TABLE 2. BANDING RECOVERIES TO THE END OF 1957 FROM 226 MALLARDS RELEASED IN THE CHIGNECTO ISTHMUS, 1953-1955

	Local Recoveries	Distant Recoveries	Total
Direct	11	10	21
Indirect	2	5	7
Total	13	15	28

All but one of the recoveries were dead birds. Twenty-five were killed by hunters. One reported "killed by a hawk" (Long Island, N.Y., December 4) was probably a cripple. An immature male was found dead on the marsh where it had been released a short time previously, but the cause of death was not determined. The one live recovery, an immature female, joined a flock of tame ducks in the southwestern coastal area of Nova Scotia, about 150 miles southwest, in late November of the year of release. She was very tame and allowed herself to be handled. After remaining with the flock for a few weeks she disappeared.

Distant recoveries or those made at a distance of 50 miles or more from the release points are listed in Table 3.

TABLE 3. DISTANT RECOVERIES OF MALLARDS RELEASED IN THE CHIGNECTO ISTHMUS, 1953-1955

Details of Release			Details of Recovery		Manner of Recovery
Age	Sex	Date	Date	Place	
I	M	July 12, 1954	Nov. 16, 1954	Shelburne Co., N.S.	Shot
I	F	July 12, 1954	Nov. 25, 1954	Shelburne Co., N.S.	Alive
I	M	July 12, 1954	Dec. 7, 1954	Yarmouth Co., N.S.	Shot
I	F	July 12, 1954	Jan. 1, 1955	Yarmouth Co., N.S.	Shot
I	F	July 30, 1955	Dec. 21, 1955	Shelburne Co., N.S.	Shot
I	M	July 30, 1955	Dec. 21, 1955	Shelburne Co., N.S.	Shot
A	M	July 30, 1955	Jan. 2, 1956	Queen's Co., N.S.	Shot
I	F	July 12, 1954	Nov. 11, 1955	Westport, Mass.	Shot
I	M	July 30, 1955	Jan. 7, 1957	Middlesex Co., Conn.	Killed
I	F	July 30, 1955	Jan. 5, 1957	Westerly, R.I.	Shot
I	M	July 12, 1954	Dec. 31, 1955	Long Island, N.Y.	Shot
I	F	July 30, 1955	Dec. 4, 1955	Long Island, N.Y.	Killed by hawk
I	M	Aug. 19, 1953	Dec. 26, 1953	Ocean Co., N.J.	Shot
I	F	July 30, 1955	Dec. 8, 1956	Delaware Bay, N.J.	Shot
I	F	July 12, 1954	Dec. 17, 1954	Clarendon Co., S.C.	Shot

Of 13 local recoveries all but two were made during the fall or winter of release. Two-thirds of the 15 distant recoveries were made the same fall. The indirect recoveries were all made in the year following release.

Releases at Midgic, 1953

This marsh is one of the most heavily hunted areas in the region. Of the 81 birds released there, four were shot on opening day, 1953, all by the same hunter, who commented on their lack of fear. Apparently they were also in very good condition. Another, released as an immature male, was shot locally the following year. An immature male was shot in Ocean Co., N.J., on December 26, 1953. There has been no further evidence of the Mallards released at Midgic.

Releases at Amherst Point, 1954

The releases at the Amherst Point Migratory Bird Sanctuary in 1954 provide some interesting information. This site was chosen because it offers excellent food and cover augmented by artificial food plantings and controlled water levels. At least five species of waterfowl are known to nest there. Only one or two Mallards had been recorded in previous years and observational facilities were good; any influx of this species would be apparent.

The 102 released birds appeared to acclimate themselves immediately. During most of the summer they kept to themselves in large groups of as many as 40 or 50. During that period they began to exhibit some signs of fear at the approach of humans, swimming quickly away but making no effort to take cover unless pressed.

During the late summer and autumn the Mallards gradually became integrated with the large flocks of Black Ducks that began to appear on the sanctuary and very few were seen in pure flocks. Their behavior now became more like that of the Blacks, and they were much more wary than they had been, and immediately took flight when alarmed. It would appear from the few banding recoveries available that the association with the Blacks continued into migration to the winter quarters.

Special attention was paid to the Amherst Point area during the spring and summer of 1955. During routine spring aerial surveys three lone Mallard drakes and a pair of Mallards were seen in the general region outside the sanctuary. On the sanctuary one pair of Mallards, two apparently unattached females and two mixed pairs (δ Black $\times$ ϕ Mallard) were noted several times during the spring and summer. On July 1, 1955, a well-grown duckling from a brood of three was banded. This young bird exhibited Mallard-Black hybrid characteristics, including a definitely white-bordered speculum. The brook was accompanied by a female Black Duck. During the same summer, on a marsh about 15 miles away, at Memramcook, N.B., a brood of three hybrids was banded. It also was accompanied by a female Black.

Unfortunately there was no opportunity to follow the movements of the birds released in 1955 and, except for seven banding recoveries, nothing further is known of them.

DISCUSSION

It is of interest to note that species of waterfowl less closely related to the Black Duck than the Mallard recently have successfully established themselves in the Maritime Provinces. The best example is the Ring-necked Duck *Aythya collaris*, which has advanced into this region by a regular and rapid

extension of its range, and is now increasing in number. A small colony of Pintails *Anas acuta* has established itself in the Chignecto Isthmus from an isolated beginning of one or two pairs. This species is also increasing at scattered points in the Maritimes.

Considering the assistance the Mallard has already had through artificial propagation and the apparent lack of obstacles to natural extension of its range, one would assume that it might also colonize successfully. So far this has not been the case.

The close relationship between the common Mallard and the Black Duck is well known. Delacour (1956), in describing the general habits of the Black Duck, has stated: "In display, voice and general behavior, Black Ducks are practically identical with common Mallards, which they largely replace in North-Eastern America. The only difference in the males' display is the frequent performance of a 'nod-swimming' which is independent of the 'head-up-tail-up' phase. Indeed, if it was not for a wide overlap in the breeding distribution of the two birds in the Great Lakes region, they could be regarded as conspecific. Wherever they meet, they cross readily, not only in their natural ranges but also in the East where common Mallards have been introduced by man."

The close relationship between the two species would seem to be one of the most important limiting factors in the establishment of the Mallard in the Maritimes. The intimate association and apparent interbreeding with the local Blacks indicates that the Mallards released in the Chignecto Isthmus were in the process of being absorbed into the vastly larger Black Duck population.

ACKNOWLEDGMENTS

For help with the manuscript the writer wishes to thank Dr. D. A. Munro, Chief Ornithologist, Canadian Wildlife Service. He is also grateful to Dr. G. M. McFarlane who contributed the Mallards used in the Chignecto releases and to Mr. E. A. Dixon of Sackville who assisted in the releases and gave much useful advice.

REFERENCES

- CARTER, B. C. 1950. Waterfowl breeding ground survey in the St. John Estuary, New Brunswick, 1950. *In* Waterfowl populations and breeding conditions, summer 1950. Spec. sci. Rep. Wildl., U.S. Fish Wildl. Serv. & Can. Wildl. Serv. 8: 87-89.
- . 1951. Waterfowl breeding ground survey in the St. John Estuary, New Brunswick, 1951. Same 13:86-88.
- . 1952. Waterfowl breeding ground survey in the St. John Estuary. Same 21:123-126.
- DELACOUR, JEAN. 1956. The waterfowl of the world. v.2. The dabbling ducks, p. 55. London, Country Life Ltd.
- REID, DONALD B. 1954. Waterfowl breeding ground survey in the St. John Estuary, 1954. *In* Waterfowl populations and breeding conditions, summer 1954. Spec. sci. Rep. Wildl., U.S. Fish Wildl. Serv. & Can. Wildl. Serv. 27:144-148.
- WRIGHT, BRUCE S. 1949. Waterfowl breeding ground survey in the St. John Estuary, New Brunswick, 1949. *In* Waterfowl populations and breeding conditions, summer 1949. Spec. sci. Rep. Wildl., U.S. Fish Wildl. Serv. & Can. Wildl. Serv. 2: 94-97.
- . 1953. Waterfowl breeding ground survey in the St. John Estuary, 1953. *In* Waterfowl populations and breeding conditions, summer 1954. Spec. sci. Rep. Wildl., U.S. Fish Wildl. Serv. & Can. Wildl. Serv. 25:129-131.

BIRD OBSERVATIONS AT TAHSIS INLET VANCOUVER ISLAND, BRITISH COLUMBIA

GEORGE J. MITCHELL

Alberta Department of Lands and Forests, Edmonton, Alberta

INTRODUCTION

DURING a nine-month period from December 1948 to August 1949, bird observations were made in the Tahsis Inlet region. Inasmuch as no previous systematic tabulation of the resident and transient avifauna has been recorded for this area, the bird sight records accrued during this period are presented here as a contribution to the existing information on avian distribution along the coastal waters of British Columbia.

TOPOGRAPHY

Tahsis Inlet, on the west coast of Vancouver Island, is situated approximately 190 miles northwest of Victoria and the southern tip of the island. The inlet is typical of others on the west coast in that it projects fingerlike from the outer coast inwardly towards the center of the island. Commencing adjacent to Nootka Island in the south, the inlet extends 17 miles north to the Tahsis River delta. At no point is the inlet greater than one mile wide.

The inlet is flanked by mountains ranging from 3,000 to 5,000 feet in height. Entering into the inlet at its northern extremity are the Tahsis and Perry rivers from the north and east respectively.

The topography of the area is generally rough with Rugged Mountain (6,151 feet) and McKelvie Mountain (5,350 feet) dominating the northern aspect of the study area. The only extensive level locale of the entire study area, apart from the waters of the inlet, is found in the Tahsis River valley.

The head of the inlet supports a small settlement and active sawmill and logging operations.

VEGETATION

The vegetation of this region is typical of the coast forest with merchantable quantities of Douglas fir *Pseudotsuga taxifolia*, Sitka spruce *Picea sitchensis*, Western red cedar *Thuja plicata*, Western hemlock *Tsuga heterophylla*, and Western white pine *Pinus monticola*. Other tree species include yellow cedar *Chamaecyparis nootkatensis*, and mountain hemlock *Tsuga mertensiana*. An indeterminable number of herbaceous plants form a rank undergrowth in the unlogged portions of the study area, whereas the open, logged-off areas present a tangle of logging culls and trimmings intermixed with willow *Salix* sp. and other early-successional stage plants.

The marshy deltas of the Tahsis and Perry rivers support a profuse growth of unidentified grass and aquatic vegetation.

CLIMATE

The west coast of Vancouver Island usually experiences mild temperatures and high precipitation. Heavy wet snows can normally be expected between December and February.

Records of the Department of Transport, Meteorological Division (1949) for Estevan Point, some 35 miles south of the study area, show average mean maximum and minimum temperatures of 43.1° and 30.5°; 40.7° and 27.4°; and 42.7° and 29.7° for the months of December 1948, January and February 1949. Average mean maximum and minimum temperatures recorded at this same station for July and August 1949 were 61.0° and 49.9°, and 63.5° and 51.4° respectively. A total of 20.6 inches of snow was recorded between December 1948 and the end of February 1949. The total precipitation at Estevan Point in 1949 was 95.48 inches.

ANNOTATED LIST

COMMON LOON *Gavia immer*

A lone bird was first observed on April 9. The next day another single bird was seen in the inlet. Two birds recorded on July 17 resembled the common loon but rough water conditions prevented positive identification. A spring migrant.

RED-NECKED GREBE *Colymbus grisegena*

Two grebes were seen in the inlet on May 15. A single bird was recorded four days later in the same general area. None was seen after May 19. A spring migrant.

HORNED GREBE *Colymbus auritus*

Birds of this species were first observed on February 6. Singles or groups of two birds were seen in late March and early April but none after April 9. A spring migrant.

WESTERN GREBE *Aechmophorus occidentalis*

A lone bird was first encountered on January 23. On January 28 a raft of 48 was observed feeding at the mouth of Tahsis River. The same flock was seen again on February 2 and 13, but during this latter observation only 38 birds were noted. Two were seen on March 26, and, on April 9 a raft of 15-20 birds was seen on the rough waters of the inlet. The last positive observation on this species was made on May 29.

BRANDT CORMORANT *Phalacrocorax penicillatus*

A group of six was seen almost daily in December 1948. These birds were not observed again until March 13 when two were seen in the inlet. Pairs of birds were recorded in early April with the last record occurring on April 24. A winter resident.

PELAGIC CORMORANT *Phalacrocorax pelagicus*

This cormorant was observed only on April 11, 14 and May 1. It was not a midwinter resident in the study area.

GREAT BLUE HERON *Ardea herodias*

Single specimens were observed numerous times during the period from January 9 to August 25. On June 21, a Bald Eagle was seen to swoop at and pursue a heron at the mouth of the Tahsis River. A winter and summer resident.

TRUMPETER SWAN *Olor buccinator*

A flock of 13 adult and 10 immature swans was first observed at the mouth of Perry River on January 16. On January 22, only 5 adults accompanied the ten juveniles. The total birds seen on January 23, 28 and 30 was 3, 8 and 17 respectively. These observations and those in February and March showed that both the Tahsis and Perry river deltas were being used by the swans. Observations on February 3, 6, 11, 12 and 13 gave records of 8, 12, 1, 15 and 6 birds respectively. The wide variations in counts even on successive days suggests that flock composition and size were constantly changing because of movements to and from the study area and other inlets in the region.

Fifteen swans were noted on March 6 and two on March 7 at Tahsis River. Swans were completely absent after March 7.

Additional data on swans were gathered late in 1949. On December 28, two swans arrived at the head of the inlet. About one week later one of these was mistakenly shot for a goose. On January 18, 1950 seven more swans arrived at the inlet, but these left the area the following day. At that time a group of Indians had set up camp on the Indian reserve at the mouth of the Perry River. Their presence at this favorite feeding and resting ground was probably responsible for the emigration of swans from the study area in January 1950. A winter resident.

CANADA GOOSE *Branta canadensis*

Canada Geese were first observed on April 9, at which time 6 adults were on the Perry River delta. On April 17 during stormy weather, 36 were seen flying high over the area. The last observation was on April 24 when more than 100 were seen flying above the inlet. A spring migrant.

MALLARD *Anas platyrhynchos*

The first observation was made on January 23 when ten were seen flying over the inlet. Single drakes and groups of equal number of drakes and hens were seen on many occasions in January, February, March and April. The largest flock (50-60 birds) of both sexes was seen on April 9. This duck is a winter resident and probably nests in the marshy areas of the Tahsis and Perry rivers.

AMERICAN WIDGEON *Mareca americana*

One lone drake was seen on March 30 and again on March 31. A spring migrant at the inlet.

GREATER SCAUP DUCK *Aythya marila*

Small flocks were observed on February 5, 6, 11, and on March 6 and 26. On these days, one or two drakes with four or fewer hens were observed feeding at the head of the inlet. A winter resident.

COMMON GOLDENEYE *Bucephala clangula*

Goldeneyes were a scarce winter resident on the study area between January 23 and early April with only three or four birds being observed during each field trip. A sudden influx or concentration of birds occurred on April 9

at which time 28 birds were rafted adjacent to the mouth of Perry River. This flock was not seen again. On the last observation on April 24, two drakes and one hen were seen.

BUFFLEHEAD *Bucephala albeola*

Like the goldeneye, this species was not an abundant winter resident on the inlet. Usually only three or four birds were recorded on each field trip between January 23 and early April. Drakes always appeared more abundant than hens, especially during late March and April. The largest group of Buffleheads seen was recorded on April 9 at the Perry River delta. Approximately thirty-four birds were seen at that time. Buffleheads were not seen after this date.

HARLEQUIN DUCK *Histrionicus histrionicus*

A pair was first seen on April 17 on the Tahsis River. On April 23, three drakes and three hens were observed on the river. A single pair was seen on May 1, and on May 7 a drake and two hens were involved in what was interpreted to be a courtship display. Jerking and thrusting motions of the head accompanied by loud cries and circular swimming motion around one another completely engrossed the birds until the birds were purposely disturbed by the writer. No explanation for the extra hen participating in this action can be offered. Bretherton (1896) as reported by Kortright (1943) records a similar activity in harlequins which he interpreted as courtship action.

On May 12 a lone drake was seen. The following day two drakes and one hen were found loafing on the river. The last observation on harlequins was made on May 29 at which time four drakes and one hen were seen.

Although no nests were found, it is quite probable that the upper reaches of Tahsis River are used for nesting by this species. A summer visitant.

WHITE-WINGED SCOTER *Melanitta deglandi*

This species was not observed on the inlet before April 9. Three were seen on that date, and four on April 17. No birds were observed again until May 29 when five scoters were noted at the head of the inlet. An uncommon spring migrant.

SURF SCOTER *Melanitta perspicillata*

Rafts of Surf Scoters were observed almost daily at the head of Tahsis inlet. Flock size varied from several drakes to more than twenty drakes and hens. A flock of twenty seen on April 9 was the last observation made. A winter resident.

COMMON SCOTER *Oidemia nigra*

Small numbers of these birds were observed with Surf Scoters during the period January 2 to early April. On April 9 some thirty-two Common Scoters were observed near the Perry River delta. A winter resident.

COMMON MERGANSER *Mergus merganser*

Small numbers of these birds were observed many times between January 27 and early August. During April most of these mergansers were paired. The first and only brood was seen on July 20 near the Perry River delta. One adult and six juveniles were seen at that time. A resident.

RED-BREASTED MERGANSER *Mergus serrator*

Solitary drakes, and an occasional pair were recorded between January 27 and early April. No birds were seen after April 9. A winter resident.

HOODED MERGANSER *Lophodytes cucullatus*

A scarce winter resident, this species was seen only six times during the study period. All birds were observed in February and with one exception only a solitary drake was seen on each observation. Two drakes were seen together on February 20—the last observation—and no hens were seen in the region.

BALD EAGLE *Haliaeetus leucocephalus*

Singles or pairs of eagles were seen on numerous occasions during the first eight months of 1949. On January 30 a flock of six was seen soaring above the Perry River valley. Groups of four birds were observed on June 26 and July 1. A resident in the area from January to August at least.

RUFFED GROUSE *Bonasa umbellus*

A lone cock was seen on April 17 in the Perry River valley. Three others were recorded in this valley on July 25. A resident.

AMERICAN COOT *Fulica americana*

Coots were first observed at Perry River on January 30. The largest flock (12 birds) was seen on February 20. These birds were not abundant but were observed quite regularly on Tahsis River. The last observation was made on April 14. A winter resident.

SPOTTED SANDPIPER *Actitis macularia*

A single bird was recorded at the mouth of the Perry River on June 29. A summer resident.

GREATER YELLOWLEGS *Totanus melanoleucus*

These birds were seen only once in the inlet. On August 27, two birds were recorded near the Tahsis River delta. A fall migrant.

GLAUCOUS GULL *Larus hyperboreus*

A scarce winter resident in the study area. Three and four birds were observed weekly from January to May. After that time no observations were recorded.

GLAUCOUS-WINGED GULL *Larus glaucescens*

This gull was observed almost daily. It appeared less abundant after June. A common resident.

BAND-TAILED PIGEON *Columba fasciata*

May 15 was the date of the first pigeon arrivals in the area, when six were observed. Further observations were not obtained until June 11. After that time these birds were frequently seen until August 8. Migration began shortly after August 8, and no birds were seen after August 15. A summer visitant.

RUFous HUMMINGBIRD *Selasphorus rufus*

This bird was first seen on April 9 near the mouth of Tahsis River. Hummingbirds were quite common between April and August when four or more birds were observed on each field trip. Nests of the hummingbird were not found. A summer visitant.

BELTED KINGFISHER *Megasceryle alcyon*

Single birds were seen every month from December to August. All birds were observed in the Tahsis River valley. Paired birds were often seen in late June, July and August. A resident.

RED-SHAFTED FLICKER *Colaptes cafer*

Two were seen on May 25 on the Tahsis River. Probably a summer visitant only.

RED-BREASTED SAPSUCKER *Sphyrapicus varius ruber*

Single birds were observed on January 22, 29 and February 13. Sapsuckers were not seen after February 13.

HAIRY WOODPECKER *Dendrocopos villosus*

Single birds were observed in February, May and August. The first immature bird was seen on August 8. A resident.

VIOLET-GREEN SWALLOW *Tachycineta thalassina*

The first arrivals were observed on April 24, at which time approximately 20 birds were tallied. Flocks of similar size were seen each month thereafter until August. These birds were still numerous on August 20. A summer visitant.

BARN SWALLOW *Hirundo rustica*

Two were observed on June 15 in a flock of Violet-greens. No other records were obtained. A summer visitant.

STELLER JAY *Cyanocitta stelleri*

A common resident. Observed almost daily from January through August.

COMMON RAVEN *Corvus corax*

This bird was not abundant at any time. The first observation was made on April 2, and other sight records were obtained in May, June and July. The largest group seen contained four birds.

NORTHWESTERN CROW *Corvus caurinus*

Crows were seen almost daily. An estimated 40-50 crows resided in the study area. A resident.

CHESTNUT-BACKED CHICADEE *Parus rufescens*

Observed on May 1 and August 9. Probably a resident.

DIPPER *Cinclus mexicanus*

Dippers were observed on many occasions between January and August on the two rivers and associated streams. The first juvenile birds were seen on August 3 at which time they were seen pursuing an adult above and into the water. A resident.

WINTER WREN *Troglodytes troglodytes*

Only two observations were made on this bird. A single wren was seen on April 4 and 24. Probably a resident.

AMERICAN ROBIN *Turdus migratorius*

First seen at the inlet on April 3. Robins were commonly seen from that date until August. First fledglings seen on July 4. A summer visitant.

VARIED THRUSH *Ixoreus naevius*

Seen almost daily from January through July. These birds appeared less conspicuous after May 1. A resident.

CEDAR WAXWING *Bombycilla cedrorum*

First sight records were obtained on July 4 when five were seen in an old orchard along the Perry River. Two were seen near the millsite on August 21. A summer visitant.

MACGILLIVRAY WARBLER *Oporornis tolmiei*

Ten were observed on April 24. On June 19 and August 9, one pair of warblers was seen. A scarce summer visitant.

HOUSE SPARROW *Passer domesticus*

Resident and very abundant.

BREWER BLACKBIRD *Euphagus cyanocephalus*

The first and only record of this bird was taken on April 3.

RUFIOUS-SIDED TOWHEE *Pipilo erythrophthalmus*

This bird was first observed on January 5. Thereafter single birds were observed until February 21. No birds were recorded after that date. A winter resident.

SLATE-COLORED JUNCO *Junco hyemalis*

Two birds were seen on February 20. Single birds were recorded on February 25, March 5 and 10. This junco was not seen after March 10. Munro and Cowan (1947) mention that this junco winters in small numbers in the southern parts of the province but they do not list any specimen or observational records for Vancouver Island.

OREGON JUNCO *Junco oreganus*

First seen on February 6, and thereafter every week until May. Recorded again during the last week of August. A common resident.

WHITE-CROWNED SPARROW *Zonotrichia leucophrys*

The first and only observation was made on April 17 when two sparrows were observed. Scarce summer visitant.

GOLDEN-CROWNED SPARROW *Zonotrichia atricapilla*

Six seen on April 26 was the earliest record of these sparrows. On May 1 approximately 20 were seen. The last record was obtained on May 7. A summer visitant.

FOX SPARROW *Passerella iliaca*

A single bird seen on April 3 was the first observation obtained. Other single birds were recorded until July 12. After that date this species was not seen. A spring and summer visitant.

SONG SPARROW *Melospiza melodia*

First seen on March 13, this bird was quite common throughout the summer. The last observation was made on August 8. A spring and summer visitant.

HYPOTHETICAL LIST

Positive identification of the following species was not achieved but the species are given here as possible members of the bird fauna of the inlet.

GOSHAWK *Accipiter gentilis*

One observation on February 25.

SEMIPALMATED SANDPIPER *Ereuntes pusillus*

Fourteen seen on July 3 and July 10.

SHORT-BILLED GULL *Larus canus*

Eight seen in early August.

DOWNY WOODPECKER *Dendrocopos pubescens*

Singles were observed on February 6 and 13.

AMERICAN GOLDFINCH *Spinus tristis*

Eight were seen on April 24. On June 19 and August 9, a single pair was observed.

REFERENCES

- Bretherton, Bernard J. 1896. Kodiak Island, a contribution to the avifauna of Alaska. Ore. Nat. 3:45-49, 61-64, 77-79, 100-102.
 Kortright, Francis H. 1943. The ducks, geese and swans of North America. American Wildlife Institute.
 Munro, J. A., and I. McT. Cowan. 1947. A review of the bird fauna of British Columbia. British Columbia Provincial Museum.

Received for publication 11 March 1958

RECORDS OF MARINE FISHES FROM FRESH WATER IN BRITISH COLUMBIA

DON E. McALLISTER

Institute of Fisheries, University of British Columbia, Vancouver 8
British Columbia

THE EXCELLENT checklist of the fresh water fishes of Canada and Alaska by Scott (1958) has prompted the publication of some additional records of marine fishes entering fresh water in British Columbia. These are as follows:

SPINY DOGFISH *Squalus acanthias* Linnaeus. This species has been observed in fresh water in British Columbia (Gunter, 1942) and was also recorded from fresh water in Denmark (Feddersen, 1879). The spiny dogfish of the Pacific, *Squalus suckleyi*, has been synonymized with the Atlantic *Squalus acanthias* (Bigelow and Schroeder, 1948).

HERRING *Clupea harengus pallasii* Valenciennes. Occasionally the herring is stranded near river mouths in fresh water in B.C. when it comes up on the beaches to spawn¹. It has been taken in California at a chlorinity of .81 (Hubbs, 1947). The herring of the North Pacific has been regarded as a distinct species, *Clupea pallasii*. In his revision of the Clupeidae, Svetovidov (1952) reduces it to a subspecies of the North Atlantic herring, *Clupea harengus*.

¹These species were recorded by Gunter (1956), without locality, as occurring in both fresh and pure salt water. In reply to my inquiry Dr. Gunter wrote that these fish had been reported in fresh water in British Columbia. The author is grateful to Dr. Gunter for this information. Thanks are also due to Dr. C. C. Lindsey of the Institute of Fisheries, University of British Columbia; Dr. R. R. Miller of the Museum of Zoology, University of Michigan; Dr. W. B. Scott of the Royal Ontario Museum; Nancy McAllister and Clarence L. Smith of the University of Michigan for reading the manuscript.

YELLOW SHINER *Cymatogaster aggregata* Gibbons. The yellow shiner has been recorded from fresh water in British Columbia¹ as well as in California (Hubbs, 1947 and Gunter, 1942). The species name has been written with a *us* ending, but since the generic name is feminine, the species name must end in *a* (Tarp, 1952).

SHARPNosed SCULPIN *Clinocottus acuticeps* (Gilbert). The sharpnosed sculpin was seined by the author and his wife in a small creek entering Lyell Harbor from Saturna Island on the southern coast of British Columbia. The collection was made at low tide in the upper reaches of the tidal zone of the creek; since the water was shallow and running there can be no doubt that the fish were in fresh water. According to Clemens and Wilby (1949), this sculpin inhabits tide pools and as such a habitat is subjected to dilution by rain and seepage, fresh water tolerance by this species is not surprising. The specimens are now in the museum of the Institute of Fisheries, University of British Columbia (Catalogue No. BC56-81).

CABEZON *Leptocottus armatus* Girard. The cabezon was taken with *Clinocottus acuticeps* in fresh water at Saturna Island (BC56-81). It has also been taken in fresh water in British Columbia in the Serpentine River at Cloverdale, 6 miles from the sea but within tidal influence (BC55-262). Another collection at the Institute of Fisheries is from fresh water on Kodiak Island, Alaska. Gunter (1942) recorded this form in fresh water in Washington and Alaska, and Hubbs (1947) has recorded it in California at a chlorinity of .57. The cabezon is a tidepool-inhabiting species (Clemens and Wilby, 1949).

STARRY FLOUNDER *Platichthys stellatus* (Pallas). The starry flounder is well known for its ability to enter fresh water. Clemens and Wilby (1949), Orcutt (1950), and Gunter (1942) all affirm that it is euryhaline. Hubbs (1947) has taken it at a chlorinity of .57 in California. The author has seined specimens in shallow water in the Pitt River, a lower tributary of the Fraser, more than 20 miles from the sea (BC58-70).

REFERENCES

- BIGELOW, H. B., and W. C. SCHROEDER. 1948. Sharks. In *Fishes of the western North Atlantic*. New Haven, Memoirs Sears Foundation for Marine Research, No. 1, Part 2.
- CLEMENS, W. A., and G. V. WILBY. 1949. *Fishes of the Pacific coast of Canada*. Bull. Fish. Res. Bd Canada 68.
- FEDDERSEN, V. A. 1879. *Gadus morrhua* in fresh water. Translation by T. H. Bean. Amer. Nat. 14:525-526.
- GUNTER, G. 1942. A list of the fishes of the mainland of North and Middle America recorded from both fresh water and sea water. Amer. Midl. Nat. 28:305-326.
- GUNTER, G. 1956. A revised list of euryhaline fishes of North and Middle America. Amer. Midl. Nat. 56:345-354.
- HUBBS, CLARK. 1947. Mixture of marine and fresh-water fishes in the lower Salinas River, California. Copeia (2):147-148.
- ORCUTT, H. G. 1950. The life history of the starry flounder, *Platichthys stellatus* (Pallas). Calif. Div. Fish Game Fish. Bull. 78.
- SCOTT, W. B. 1958. A checklist of the freshwater fishes of Canada and Alaska. Royal Ontario Museum, Division of Zoology and Palaeontology.
- SVETOVIDOV, A. N. 1952. Fishes: Herrings (Clupeidae). (In Russian). Fauna S.S. S.R. 2(2).
- TARP, T. H. 1952. A revision of the family Embiotocidae (surfperches). Calif. Div. Fish Game Fish. Bull. 88.

OBSERVATIONS ON MARINE BIRDS OFF SOUTHWESTERN NOVA SCOTIA

DAVID M. SCOTT

Department of Zoology, University of Western Ontario, London, Ontario
and

Fisheries Research Board of Canada, Biological Station, St. Andrews, New Brunswick

THE PRINCIPAL accounts of the birds of Nova Scotia (Downs, 1888; Allen, 1916; Tufts, 1956) give few details on the marine birds of that province. Accordingly, our records of marine birds observed in the summer of 1957 off the southwestern coast of Nova Scotia may be of some interest.

Most of our observations were made at sea within a 10-mile radius of Lockeport, Shelburne County, Nova Scotia, during two periods: May 27 to June 24 and August 16 to 23. On each of 28 days during these two periods we spent at least four hours at sea. Most of the time at sea was spent within three miles of land. We went beyond this limit on eight days: May 27, 28 and 30; June 3, 19 and 21; August 16 and 22. In the spring our observations were greatly restricted by the presence of fog in the Lockeport area. We encountered thick fog on 7 of the 21 days spent at sea in May and June. There was no fog during our week in August at Lockeport.

Additional observations were made on a trip by sea from St. Andrews, N.B., to Lockeport, N.S., on August 15 and 16. The course followed on this trip took us past Deer I., N.B., and Campobello I., N.B., then along the east coast of Grand Manan I. and across the Bay of Fundy to Freeport, N.S. From Freeport we crossed St. Mary Bay to Meteghan, N.S., where we spent the night of August 15. The following day we sailed from Meteghan around Cape Sable to Lockeport. Dense fog was encountered between Yarmouth, N.S., and Cape Sable and no observations were made on this part of the journey.

All observations were made incidental to the author's duties on the M. B. *Mallotus* on which he was employed as a fisheries biologist by the Fisheries Research Board of Canada, St. Andrews, N.B. Clarence J. Bayers was the captain of the *Mallotus*. It is a pleasure to acknowledge his interest and assistance. Some records of interest made by Bayers when the author was no longer with the vessel are included.

For most species seen in the Lockeport area, the number of days on which the species was observed and, in parentheses, an approximate total number of individuals seen are noted immediately following the scientific name.

All specimens collected are now in the collection of the Department of Zoology, University of Western Ontario.

FULMAR *Fulmarus glacialis*, 1(3). Three (one collected) were seen on June 19 as they followed the vessel while we were setting trawl about 10 miles south of Lockeport. The visibility on this day was poor, rarely exceeding two miles and much less in the numerous fog patches. The wind was from the

south at 15 mph. Two days later in the same locality no fulmars were seen. This day was clear and windless with a visibility of about 10 miles.

GREATER SHEARWATER *Puffinus gravis*, 9(58). The first was seen and collected on June 6 near the Lockeport whistle buoy, about three miles from the nearest land. Thereafter in June the Greater Shearwater was seen on eight days. The daily numbers exceeded four only on the two occasions after June 6 when we were farther offshore than three miles. On the first of these occasions, June 19, we were setting trawl about 8 to 10 miles south of Lockeport. On this day, 40 Greater and 10 Sooty shearwaters were seen. The birds, particularly the former species, were characteristically fearless and voracious, flying close by the stern of the *Mallotus* to seize or to dive for pieces of herring bait. Three male and two female Greater Shearwaters were collected. In the same area on June 21, when the weather was much different than that on June 19 (see above under Fulmar), only six Greater Shearwaters were noted.

None was seen in the Lockeport area in August. It may be noteworthy that there were no southerly winds or fog during our visit to Lockeport in August.

On August 15 this species was first met about halfway across the Bay of Fundy and in the following hour 11 were seen. Three were seen while crossing St. Mary Bay from Freeport to Meteghan. On the following day three were seen about two miles off Cape St. Mary, N.S.

C. J. Bayers told me that on July 9, 1957, while steaming in a thick fog just south of Meteghan, N.S., he passed for five minutes through a huge raft of Greater and Sooty shearwaters.

SOOTY SHEARWATER *Puffinus griseus*, 24(about 125). This species was, apart from gulls and terns, the most regularly seen sea bird in the Lockeport area. It was first seen on May 27 and almost daily thereafter. Usually only single birds or groups of two or three were seen, but on June 14 a small concentration of 15 to 20 birds was seen about one mile south of Ram I. near Lockeport. These were feeding on small fish along the edges of tide rips. Another time, on June 21, 11 were seen in one flock. Sooty Shearwaters were clearly more littoral in their distribution than Greater Shearwaters; on only one day were the latter more common. It is widely known, however, that Greater Shearwaters are many times the more common species on the offshore fishing banks of Nova Scotia and Newfoundland.

Five specimens were collected in the Lockeport area. The first, one of a pair resting on the water close by Lesser Hope Rock, was taken on June 6 about one mile offshore from the entrance to Port Joli harbor. This bird was very thin, in a condition contrasting markedly with the presence of extensive deposits of fat on three birds taken on June 14 near Ram I. The fifth specimen, taken on August 16 about seven miles southwest of Lockeport, was also very fat.

Sooty Shearwaters were not seen on our crossing of the Bay of Fundy until we were within about 10 miles of the Nova Scotian coast. Following the first observation, 11 birds were seen in the next five miles.

LEACH'S PETREL *Oceanodroma leucorhoa*, 6(26). This petrel was rarely seen in the Lockeport area and then usually when we were more than five miles offshore. The species does, however, breed in this area for we found several nesting burrows on the seaward face of Ram I. ($43^{\circ}41'N$, $65^{\circ}02'W$). A single egg being incubated by a male petrel was present in the only burrow that we examined on June 4. It is worthy of note that this breeding station of Leach's Petrel and, as we shall see, of the Black Guillemot is farther south than any breeding stations occupied today by these species in Maine (Palmer, 1949). Bent (1919, 1922) stated that both species nested on Seal I., N.S. ($43^{\circ}24'N$). Fisher and Lockley (1954, p. 12) apparently erred in stating that Maine was the southernmost breeding station of these species in the western Atlantic.

Eight Leach's Petrels seen about 10 to 15 miles west of Freeport were the only petrels noted on the trip across the Bay of Fundy on August 15.

GANNET *Morus bassanus*, 9(30). Occasional individuals were seen around Lockeport, especially in May and June when a total of 27 gannets was seen. Four of these appeared to have full adult plumage. Twenty were in the dark juvenile plumage and the remaining three were predominantly white except for dark wings. A Gannet in dark juvenile plumage and two with dark wings and white bodies were seen singly near Lockeport on August 16, 17 and 19.

One near the north end of Grand Manan I. and another about halfway across the Bay of Fundy were the only Gannets noted on August 15.

DOUBLE-CRESTED CORMORANT *Phalacrocorax auritus*, 5(46). This species was seen much less frequently than we had expected. In June it was seen only on three days and on each occasion was very close to shore. The largest concentration was a group of 15 noted at the entrance to Port Joli harbor on June 6. In August we saw one flock of 16 and another of 8 cormorants, presumably of this species, flying at a considerable height along the coast.

COMMON EIDER *Somateria mollissima*, 5(61). This bird, like the previous species, was seen only close to the mainland or to small islets. Small groups containing up to 20 birds of various ages were seen on four occasions in June. An adult male with testes about 4 mm long was collected on June 6 from a group of 20 eiders near the entrance to Port Joli harbor. A female with no obvious enlargement of ova was collected on June 20 from a flock of 12 birds near Gull Rock at Lockeport. In August only two eiders were seen near Lockeport.

RED PHALAROPE *Phalaropus fulicarius*, 2(19). When we arrived at Lockeport in May a few Red Phalaropes were present. On May 28 two flocks of eight birds (same flock twice?) and on May 30 three birds were seen resting on the sea about nine miles southeast of Lockeport. C. J. Bayers told me that phalaropes, known to him as sea geese, had been much more

common in the fortnight preceding my arrival at Lockeport. No Red Phalaropes were seen at Lockeport in August.

We encountered thousands of phalaropes while crossing the Bay of Fundy on August 15. Flocks of phalaropes, most containing between 15 and 30 birds, became particularly numerous about two miles east of White Head I. which lies off the southeast corner of Grand Manan I. For an hour as we steamed south, flock after flock of phalaropes crossed our bow as they flew southwest into a stiff breeze. Most flocks were small but two flocks each contained at least 500 birds. Both Red and Northern phalaropes were present with the latter outnumbering the former by at least 5 to 1. Stragglers of both species were noted until we were about 10 miles off the Nova Scotian coast. Two adult female Red Phalaropes were collected. Each was mostly in winter plumage except for extensive patches of chestnut feathers on the belly.

NORTHERN PHALAROPE *Lobipes lobatus*, 3 (ca. 120). None was seen in the vicinity of Lockeport in May or June. The species was present at Lockeport in August.

We first saw this species on August 15. A flock of seven birds was noted in Grand Manan Channel. Thereafter on the same day many flocks were seen as we skirted the east side of the Grand Manan Archipelago. Like the preceding species the Northern Phalarope was seen most frequently in the 10-mile stretch of sea extending south from White Head I. None was seen on the Nova Scotian side of the Bay of Fundy. No phalaropes were seen on the following day, August 16, until we had rounded Cape Sable to the eastward. At this point, when we were about four miles offshore, we began to meet small numbers of phalaropes. About 60 (all that were seen well were Northern Phalaropes) were observed between Cape Sable and a point three miles south of Cape Roseway. At the latter point, a male Northern Phalarope was collected from a flock of 11 birds. Fifty Northern Phalaropes (three males collected) were seen on August 19 feeding among long rows of drifting seaweed five miles south of Lockeport and four days later, on August 23, three were noted about a quarter of a mile south of Ram I.

PARASITIC JAEGER *Stercorarius parasiticus*. No jaegers were seen in the Lockeport area.

All the jaegers we observed were seen on August 15 on the passage from St. Andrews, N.B., to Meteghan, N.S. Only three were specifically identified. All were pale forms of the Parasitic Jaeger. The first was seen about one mile southeast of Great Duck I. off the east coast of Grand Manan I. The other two were seen in St. Mary Bay about four miles east of Freeport, N.S. These birds were easily identified as they flew south about 50 yards in front of the boat at a height of about 100 feet. Four other jaegers seen on this day were too far off to permit specific identification. One pale bird was seen chasing terns near Wilson's Beach, N.B. A dark jaeger was noted near the north end of Grand Manan I. Two hours later we saw a dark one harrying a flock of 200 phalaropes near White Head I. Finally, a dark jaeger was seen in the Bay of Fundy about 10 miles west of Freeport, N.S.

SKUA *Catharacta skua*, 2(2). On June 7 we were fishing about five miles south of Lockeport. At 10.15 A.M. we saw a large dark bird chasing some Great Black-backed and Herring gulls. Despite the poor visibility in the fog existing at the time, large white flashes on the primaries were clearly evident. The bird was thought to be a Skua. Six hours later while we were fishing about two miles farther inshore, a Skua came close to the stern to pick up fish entrails. The bird was collected. It was an immature female with very worn plumage, possibly that of the first summer. While skinning the bird I noticed that there was almost no subcutaneous fat. Indeed, the bird could well be described as emaciated. Our identification was subsequently confirmed by Mr. L. L. Snyder of the Royal Ontario Museum of Zoology. We sought this confirmation because of the small size of the specimen. Some measurements of this bird were: wing, 364 mm; tail, 137 mm; exposed culmen, 46 mm; tarsus, 64 mm. These dimensions are less than the minima recorded for the North Atlantic race, *C. s. skua*, in Witherby and others (1949, vol. 5, p. 126). The measurements approximate more closely those of *C. s. antarctica* or *C. s. chilensis* as given by Murphy (1936, p. 1011) than those of any other race of Skua discussed by Murphy.

A second Skua was seen clearly at a range of 50 yards on August 22 about eight miles south of Lockeport.

GREAT BLACK-BACKED GULL *Larus marinus*. This species was, apart from the Herring Gull, the most abundant sea bird in the Lockeport area. It was breeding on Ram I. when we landed there on June 4. Downy young at least several days old and eggs well advanced in incubation were found. We had insufficient time to count the number of nests but we guess that there were at least 50 pairs of Great Black-backed Gulls nesting there.

HERRING GULL *Larus argentatus*. This was the most common sea bird around Lockeport, occurring in the hundreds around the wharves in Lockeport harbor, as well as farther offshore. This species, as well as the preceding, was seen commonly on the trip across the Bay of Fundy.

BONAPARTE'S GULL *Larus philadelphia*. This gull was not seen in the vicinity of Lockeport.

On August 15 we saw 150 (mostly adults) off the west side of Deer I., N.B.; 100 off Wilson's Beach, N.B.; and 10 off the north end of Grand Manan I.

COMMON TERN *Sterna hirundo*. Despite the fact that Lockeport lies within the breeding range of the Arctic Tern *S. paradisaea*, and the Roseate Tern *S. dougallii*, the Common Tern was the only tern certainly identified in this area. It was confined almost exclusively to the waters within a mile or two of shore. The Common Tern almost certainly breeds in the Lockeport area. No breeding colonies were found, but on June 20 we saw a dozen or more terns flying with fish in their bills towards some rocky islets near West Head just to the southwest of Lockeport. In August, there were many young terns near Lockeport.

Flocks of two or three hundred terns (species?) were seen on August 15 near Wilson's Beach and again off the north end of Grand Manan I.

RAZORBILL *Alca torda*, 1(1). The only Razorbill seen was collected on June 7 about five miles south of Lockeport. The bird was an adult male in nuptial plumage. The testes were enlarged; the right testis was 10 mm and the left testis 14 mm long.

COMMON MURRE *Uria aalge*, 1(2). Our only record of this species was made on June 24 when we watched two birds in summer plumage about one mile southwest of Ram I.

DOVEKIE *Plautus alle*, 1(1). Only one was seen. It was collected on June 18 one mile south of Ram I. The bird was a female with no obvious enlargement of the ova. Summer plumage had been largely acquired. The remiges, wing coverts and rectrices were faded and badly worn.

BLACK GUILLEMOT *Cepphus grylle*, 6(about 50). This species in the Lockeport area was seen only within two miles of shore. Black Guillemots apparently breed on low cliffs on the landward side of Ram I. We did not look for nests but on several days we saw birds disappearing into crevices in the cliff. A female collected near Ram I. on June 24 had enlarged ova and extensive brood patches. We estimate that there were about 50 guillemots using the cliffs on Ram I. They were commonly seen on the sheltered waters on the landward side of the island, but were rarely seen on the seaward side.

COMMON PUFFIN *Fratercula arctica*, 1(1). An immature male, the only puffin seen, was collected on June 14 five miles south of Lockeport.

REFERENCES

- ALLEN, E. C. 1916. Annotated list of birds of Yarmouth and vicinity, southwestern Nova Scotia. Proc. N.S. Inst. Sci. 14: 67-95.
- BENT, A. C. 1919. Life histories of North American diving birds. Bull. U.S. nat. Mus. 107.
- , 1922. Life histories of North American petrels and pelicans and their allies. Bull. U.S. nat. Mus. 121.
- DOWNS, A. 1888. A catalogue of the birds of Nova Scotia. Proc. Trans. N.S. Inst. nat. Sci. 7: 142-178.
- FISHER, J., and R. M. LOCKLEY. 1954. Sea-birds. London, Collins.
- MURPHY, R. C. 1936. Oceanic birds of South America. V. 2. New York, American Museum of Natural History.
- PALMER, R. S. 1949. Maine birds. Bull. Mus. comp. Zool. Harv. 102.
- TUFTS, R. W. 1956. Annotated list of Nova Scotia birds. N.S. Mus. Sci. Newsletter 1(4), Supplement.
- WITHERBY, H. F., F. C. R. JOURDAIN, N. F. TICEHURST, and B. W. TUCKER. 1941. The handbook of British birds. V. 5. London, Witherby.

Received for publication 18 April 1958

MIGRATIONS OF CARIBOU IN A MOUNTAINOUS AREA IN WELLS GRAY PARK, BRITISH COLUMBIA

R. YORKE EDWARDS and RALPH W. RITCEY

Parks Branch, Department of Recreation and Conservation, Victoria, British Columbia

FIELD WORK on which this paper is based had the original objective of gathering information on the life history and ecology of caribou *Rangifer arcticus* in Wells Gray Park, British Columbia. It was soon apparent, however, that it was a major problem simply to find caribou in the field. These animals inhabit rugged terrain in which they do much wandering. Since the total population is small, probably less than 200 animals, small bands are characteristic. Their small number adds to the difficulty of finding or trailing these animals. A biologist afoot, intent upon studying these caribou, could easily devote most of his time to searching. As a result of this difficulty, high priority was given to a search for facts on the local distribution of these caribou, and to the changes in distribution that accompany the changing seasons. This paper deals with results from this study of distribution.

Data have been gathered since 1951 on reconnaissance trips from park headquarters, and in two years by an observer living through the winter in a cabin located near wintering caribou. Aircraft have been used sparingly, and with variable success, to locate inhabited areas. Horses and aircraft were used regularly to transport supplies. Most field work was undertaken on foot, frequently while carrying equipment and food sufficient for periods up to a week. Field work in winter could not be undertaken when snow conditions made snowshoeing impossible.

Studying caribou in mountainous terrain is strenuous work with small returns in knowledge from long hours afield in all kinds of weather. Much winter field work connected with this study was done by R. G. Miller, on his own time as a trapper as well as while employed by the Parks Branch of the British Columbia Department of Recreation and Conservation. He is a good wilderness traveler and a keen observer, whose field notes are unusually accurate and complete.

DESCRIPTION OF AREA

The area to which most caribou are confined in Wells Gray Park centers on a valley the floor of which has an elevation of 3500 feet. Contained in the valley is Murtle Lake, an irregularly shaped lake some 14 miles long. About the lake are rounded mountains, foothill-like elevations, reaching up to 8000 feet. These tend to have flat or rounded tops, so are characterized by extensive alpine meadows above timberline.

These rounded mountains are transitory to high, rugged mountains to the north where the topography is precipitous, and extensive glaciers cover many square miles. This rugged topography is not favored by caribou (Edwards, 1958).

The climate of this area is characterized by frequent rainfall in summer and by cold winters with heavy snowfalls. Precipitation is evenly distributed throughout the year, varying locally with elevation and, in the valleys, with

proximity to mountains. The mountains foster local storms. While the uplands receive frequent showers, parts of the broad valleys receive them less frequently. Snow depths in winter vary much as does precipitation in summer. Six to 10 feet of snow may pile up at timberline by late winter when valley bottomlands have only two or three feet of snow on the ground.

The local climates are reflected in the vegetation. At an altitude of about 2000 feet, lowest valleys have dry Douglas fir *Pseudotsuga menziesii*—grassland conditions on the warmest slopes. With increasing elevation the forest becomes one of red cedar *Thuja plicata*, western hemlock *Tsuga heterophylla*, alpine fir *Abies lasiocarpa* and Engelmann spruce *Picea engelmanni*. This is the Columbia forest of Halliday (1937), known within this province as the Interior Wet Belt. This dense forest resembles in some respects the coniferous 'rain forest' of the Pacific Coast, for in both forests the climax dominants appear to be red cedar and western hemlock. About 4000 feet this lowland forest gives way to a deep belt of subalpine forest, composed mainly of Engelmann spruce and alpine fir. This forest becomes increasingly open with elevation. Poorly drained sites in this forest have open stands of lodgepole pine *Pinus contorta*. At about 7000 feet the forest openings have enlarged to form extensive alpine meadows. These are variable in their vegetations, depending in part upon soil depth and available water. There are, however, no ground lichens, such as *Cladonia*, anywhere in this area with sufficient size or abundance to provide useful lichen pastures for caribou.

Fire has considerably modified the pattern of vegetation in this park. Much of the forest below 3000 feet has been burned. These lands now support stands of willow (*Salix* spp.), aspen *Populus tremuloides* and birch *Betula papyrifera* and *B. glandulosa*. Caribou do not usually frequent these burns (Edwards, 1954) but confine their lowland range to unburnt coniferous forest, and to shores, lakes when frozen, and meadows associated with this forest.

PATTERN OF MIGRATIONS

Like deer *Odocoileus hemionus* and moose *Alces alces* in these mountains, the caribou there are migratory. But while both deer and moose have a rather simple migratory pattern, climbing into the mountains in spring and descending into the valleys in autumn, the pattern of caribou migration is more complex. Caribou perform two complete oscillations, or migratory descents and returns, every year. This double migration has been described briefly in a previous paper (Edwards, 1954).

These caribou inhabit alpine meadows and associated subalpine forests from June to October. In the latter month they begin to appear in lowland forests about Murtle Lake and by November they are there in numbers. They remain in this forested valley through December and much of January. By late February they have climbed to inhabit the country about timberline. They remain there from February to April inhabiting some of the coldest portions of Wells Gray Park, and at elevations having the deepest snows. In April, with the arrival of spring thaws, caribou again appear in the lowland forests. There they remain until June, when they leave the lowlands to summer in the high country, at and above timberline.

This annual pattern of altitudinal distribution, high in summer, low in early winter, high again in late winter, low again in spring, is unusual. We know of no other animal in these mountains that has a similar series of migrations, nor of one with any kind of migratory movements resulting in two treks and returns annually between alpine areas and temperate forests.

MIGRATION AND THE ENVIRONMENT

Caribou in Wells Gray Park are not browsers in any approach to the degree that mule deer and moose are browsers. Throughout the summer these caribou graze in arctic-alpine habitat, feeding extensively on the ground vegetation in timberline forests as well as above the trees.

New snow appears early in these alplands. The first falls usually come in September, but snows do not usually persist and deepen until October. As deepening snows pile upon their summer range, and snowline moves down the mountains, caribou follow the ground grazing downward. They arrive on the valley floor in October, still pawing through shallow snows, and grazing on nearly bare ground where the dense foliage of trees has held falling snow aloft. Eventually, as snows deepen, the animals can no longer obtain much ground vegetation. There follows a period of deep new snow when traveling is difficult even for a man on snowshoes. Field observations show that caribou can become relatively immobilized by such snow. They have been observed sinking to the chest in the unsettled snow of early winter. More or less trapped in the valley by this snow, the caribou turn to arboreal lichens (*Alectoria* spp.) as their major source of food. They remain in the valley, feeding on lichen, until some time in January.

Usually there is a brief but marked thaw in January which settles the soft snow. Travel becomes relatively easy as a result. The caribou climb to timberline and there, until April, continue to eat arboreal lichens almost exclusively. These lichens are more abundant near timberline than in the forests below.

Spring arrives first at lowest elevations. These caribou descend again into the valley in April while snow at timberline is still firm and provides good footing. This movement may be a retreat before thaws soften the snow, but it appears, rather, to be timed so that caribou reach the valley floor when the first ground vegetation is appearing through the melting snow. Their appearance in the lowlands in spring often coincides phenologically with the return of the first crows, robins and flickers.

The caribou remain in the valley into June, grazing mainly in meadows and open forest where snow has melted most rapidly. In that month they follow spring up the mountain slopes to their alpine summer range.

The reason for the return of these animals to the alpine meadows in early spring is not apparent from observations in the field. Perhaps it is simply a return to the most suitable summer environment, comparable to the return of birds to more northern latitudes coincident with the northward retreat of winter, and to the return of migrating springboks on the African veldt to areas where rain has ended the drought which apparently made migration necessary (Cronwright-Schreiner, 1925).

As Hochbaum (1955, p. 39) has pointed out, it appears to be part of an animal's inherited ability to somehow recognize the ecological niche to which it is adapted. This innate characteristic of animals results in the limited kinds of habitats which most animals frequent. Superimposed upon this inherited preference for a kind of place are learned traditions which may restrict the activities of the animal to a specific area that has suitable ecological attributes. This mechanism of habitat selection, partly innate, partly learned, is perhaps the explanation for some migratory movements of the caribou under study. While there is evidence that snow depths and food supply are important factors in the fall and winter treks of these animals, in spring and summer they seek alpine tundra. Perhaps by so doing they seek the most suitable environment. Seasonally this environment becomes less favorable, even uninhabitable, and the reaction of caribou is retreat, in the form of migration, to environments temporarily better suited to their needs for survival.

The lowland coniferous forest used by caribou in fall and spring is very different from the vegetation usually regarded as caribou habitat. This is one of the densest forests in temperate North America, closely allied to the west coniferous 'jungles' on the coasts of Oregon, Washington, British Columbia and southern Alaska. In an abundance of moisture, growth is rapid and trees are large, while a dense canopy shades the ground. Caribou often frequent the densest stands, grazing on ground vegetation or taking foliage from undergrowth. More time is spent in forest openings, however, at forest edges along beaches, and in open meadows and bogs associated with this forest on flat terrain.

While the foods eaten by these caribou will be the subject of a separate paper, the role of arboreal lichens in this pattern of caribou migrations is worthy of brief treatment here. Survival of these caribou through each winter seems to depend upon these lichens as the principal food supply. The distribution of these lichens in space is important to an understanding of their unique role as winter food. They may occur on trees from lowest branches to the highest twigs, although environmental limitations may vary their abundance according to forest site, distance from the ground, and the species of tree concerned. While snow may quickly cover the grasses and herbs used by animals grazing on the ground, and may less rapidly bury twigs used by browsing animals, these arboreal 'lichen pastures' are quite different. Arboreal lichens are especially abundant near timberline. Here also the climate in winter produces deep but firm snow on the ground. Deepening snow of this kind enables feeding animals to reach higher into the trees and so obtain previously unavailable sources of lichen. Deepening snows brings fresh supplies of edible lichen within reach. The distribution of this food supply in space can result in deep snow being an asset to caribou, provided that the snow is solid to walk upon.

Some caribou on the Arctic tundra of Canada perform a 'double migration' every year (Clarke, 1940; Banfield, 1954) but it is quite different from that noted in Wells Gray Park. In both cases there is movement from tundra to forest in autumn, and a return to tundra in spring. While the Wells Gray animals perform another complete oscillation in winter, the Arctic animals make addi-

tional treks in late summer. In the latter case the main migration from winter range carries them deep into the barrens by July. In a few weeks they move back towards treeline, pause while still on tundra, move away from treeline in September, then, with the first severe blizzards, move again toward treeline and forested winter range. The summer movement away from treeline does not carry them so far into the tundra as does the main trek in spring.

There appears to be no direct relationship between the two extra oscillations, one in winter, the other in summer. In the mountains there is a return in winter to elevations frequented in summer; on the barrens there is a movement in late summer over terrain hurried through in spring. These treks in Wells Gray Park seem necessary to utilize the best supplies of food available. Future work in the north may uncover similar causes.

SUMMARY

Caribou *Rangifer arcticus* in Wells Gray Park, British Columbia, migrate between alplands above 7000 feet and lowland coniferous forest at 3500 feet. Migrations differ from those of deer *Odocoileus hemionus* and moose *Alces alces* which descend in autumn, climb in spring. These caribou move down in late autumn, climb in January to winter near treeline, descend again in April, then climb again in May or June. Factors controlling these migrations appear to be available food supply as affected by snow, and the influence of snow upon the mobility of the animals. At timberline, in winter, an abundance of arboreal lichens is made available by deep, firm snow.

REFERENCES

- BANFIELD, A. W. F. 1954. Preliminary investigations of the barren ground caribou. Wildl. Mgmt Bull., Ser. 1, No. 10A.
- CLARKE, C. H. D. 1940. A biological investigation of the Thelon Game Sanctuary. Bull. nat. Mus. Canada 96.
- CONWRIGHT-SCHREINER, S. C. 1925. The migratory springbucks of South Africa. London, T. Fisher Uuwin.
- EDWARDS, R. Y. 1954. Fire and the decline of a mountain caribou herd. J. Wildl. Mgmt 18:521-526.
- EDWARDS, R. Y. 1958. Land form and caribou distribution in British Columbia. J. Mammal. 39: in press.
- HALLIDAY, W. E. D. 1937. A forest classification for Canada. Bull. For. Serv. Canada 89.
- HOCHBAUM, H. A. 1955. Travels and traditions of waterfowl. Minneapolis, Univ. Minn. Press.

Received for publication 23 April 1958

ELYTRAL PATTERN DISTRIBUTION IN ADJACENT
POPULATIONS OF *CHRYSOMELA AENEICOLLIS*

(Schaeffer)

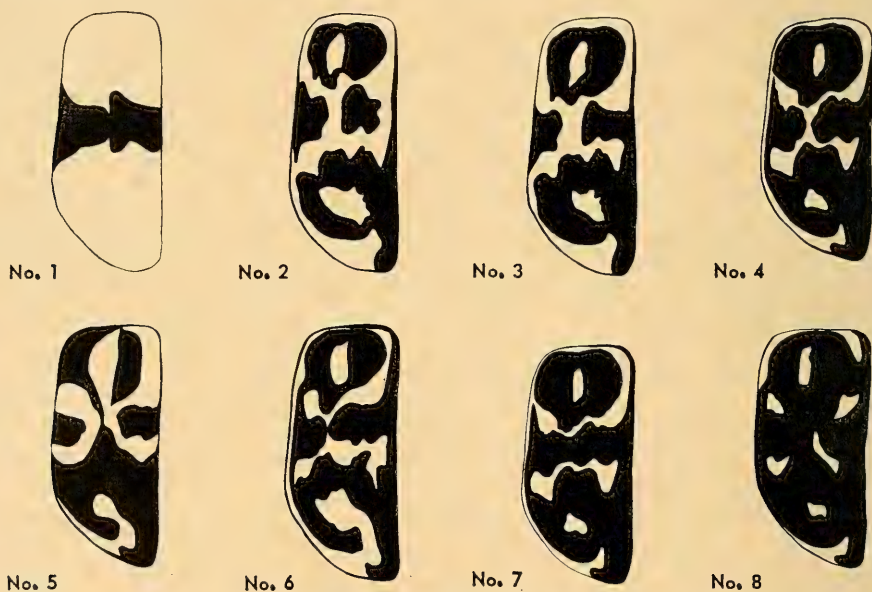
(Coleoptera: Chrysomelidae)

WALTER ROBERT HENSON

Yale University School of Forestry, New Haven, Connecticut

DURING the field season of 1957, three vigorous colonies of *Chrysomela aeneicollis* (Schaeffer) were found on willow in the Rocky Mountains of western Canada. The first of these was at Lake Louise, Alberta, the type locality of the species (Schaeffer, 1928). The second was at the summit of the Vermilion Pass in British Columbia and the third at the junction of Little Yoho Creek and the Yoho River. Collections were made from these colonies on a number of occasions. The identification was confirmed by W. J. Brown.

The elytral pattern of these insects was at once seen to be strikingly variable. The range of variation was as wide within the very small area of single colonies as that described by Brown (1956) for the entire range of the species.

FIGURE 1. Elytral patterns in *Chrysomela aeneicollis* (Schaeffer).

Collected insects were sorted, without regard to sex, locality or time of collection, into a single series with elytral patterns ranging from 'light' to 'dark'. When the series was examined, there appeared to be eight groups of patterns. No two insects were indistinguishable so these groups represent concentrations in a continuum rather than the outcome of discontinuities. Single insects were taken from the numerical center of each group and dia-

grams of their elytral patterns prepared. These diagrams are presented in Figure 1.

The basic pattern of elytral marking consists of paired basal, median, and postmedian spots plus a subapical and apical spot and a dark suture. Variations in the pattern result from fusion and from increase and decrease in the size of the various spots. Pattern 1 consists of a pair of heavy median spots slightly to strongly joined. The other spots are suppressed. This pattern is similar to that illustrated by Brown (1956) for a specimen from Mount Apex, British Columbia. The complete suppression of spots does not occur in other patterns and pattern 1 appears not to belong in the same sequence as the others. In pattern 2, basal spots are joined both basally and apically, median spots are free, post median spots fused and joined to the subapical and apical spots leaving a single light dot between the four. In pattern 3, the basal spots are heavier and the inner median spot is fused to the cephalad extension of the

TABLE 1. DISTRIBUTION OF ELYTRAL PATTERN IN *Chrysomela aeneicollis*

AREA, DATE AND SEX	PATTERN							
	1	2	3	4	5	6	7	8
Lake Louise (16-6-57, 22-6-57, 1-7-57)								
Male	15	3	10	37	0	6	13	15
Female	7	5	15	41	3	6	15	16
Vermilion (17-6-57, 22-6-57)								
Male	0	0	5	9	1	1	7	3
Female	0	0	3	8	1	3	10	3
Yoho (3-7-57)								
Male	1	0	7	12	0	2	13	7
Female	2	1	7	17	0	1	11	11

TABLE 2. ELYTRAL PATTERN IN COPULATING PAIRS OF *Chrysomela aeneicollis*

FEMALE PATTERN	MALE PATTERN							
	1	2	3	4	5	6	7	8
1	0	0	0	0	0	1	0	0
2	0	0	0	0	0	1	3	0
3	2	0	8	3	0	0	1	1
4	1	0	0	8	0	0	1	1
5	0	0	0	0	0	0	0	0
6	0	0	4	2	0	1	1	1
7	0	1	3	2	0	4	7	7
8	0	1	3	4	0	5	0	6

apical spot. Pattern 4 differs in that all spots are heavier and the external apical border of the external median spot is fused with the postmedian spot. Pattern 5 is very anomalous and the identity of the spots with the exception of the internal basal and median spots is obscure. This pattern is excessively rare. In pattern 6, the anterior external border of the median spot is fused with the basal spot and the subapical is no longer fused with the apical. In pattern 7, the apical and subapical spots are again fused and the median spots are strongly fused. In pattern 8, the fusion is complete and six light central dots together with two light streaks at base and apex are all that remain of the light areas.

Following the preparation of the illustrations, the collections were scrambled and resorted by an assistant to eight groups conforming to the illustrations. The insects in each group were tagged and rescrambled. A second assistant resorted them without being able to use the coded tags from the earlier sorting. Less than one percent of the insects were sorted differently in the two operations and these were assigned to their groups by the author. The insects were then sorted for location and sexed. All collections from each locality were pooled because no change of pattern in time was observed.

A summary of the number of insects falling in each pattern group by sex and areas of origin is presented in Table 1.

During the course of the collecting, a number of insects in copulation were taken. All were sorted by elytral pattern of males and females into the eight groups. The results are shown in Table 2. The proportion of insects in copulation in all three areas was similar ($p = 0.98$). The data on copulating pairs were pooled to combine insects in groups 1, 2, 3 and 4 and those in groups 5, 6, 7 and 8. In this way, zero comparisons were avoided. When the pooled totals were treated as a two-by-two contingency, the distribution was shown to be unbiased (p less than 0.01). Hence, there is no evidence in these data that there is sexual selection for color pattern.

When the distribution of elytral pattern in males was compared with that in females, there was no indication that the pattern displayed a sexual difference ($p = 0.50$). From this evidence we may conclude that we have in the elytral pattern a characteristic which is distributed without sexual bias and which does not form the basis of sexual selection.

When the distribution of elytral pattern at Vermilion is compared with that at Lake Louise, the two are found to be different (p less than 0.01). When the distribution at Yoho is compared with that at Lake Louise, the two are found to be different (p less than 0.01). Vermilion and Yoho distributions are also different though at a very much lower level of confidence ($p = 0.10$).

The three collecting locations are within twenty miles of each other. However, Vermilion and Yoho are to the west of the Great Divide and separated from each other by major mountains. Lake Louise is to the east of the Great Divide in a valley which has no opening to the west below permanent snow line.

On the basis of the extreme topography of the area, rather a limited interchange of dispersing adults between the three collecting areas may be assumed. It seems possible that differences in the distribution of elytral pattern might warrant study as a tool for the investigation of the highly localized and isolated populations which are to be found in high mountain areas.

ACKNOWLEDGMENTS

I should like to acknowledge the assistance of James Saunders who prepared the diagrams and sorted the insects. N. W. Wilkinson helped me in the field and with the sorting. W. J. Brown examined material from all sources and supplied identifications. To him and to G. M. Furnival and C. L. Remington with whom the data were discussed, my thanks are due.

REFERENCES

- BROWN, W. J. 1956. The new world species of *Chrysomela* L. (Coleoptera: Chrysomelidae). Can. Ent. 88: Supplement 3. 1956.
SCHAEFFER, C. 1928. Notes on the species of *Lina* and allied genera. Can. Ent. 60: 42-47.

Received for publication 20 February 1958

CHRISTMAS BIRD CENSUS — 1958

Edited by W. Earl Godfrey

NEWFOUNDLAND

St. John's, Nfld. (City limits, harbor, 6-mile trek in suburbs).—26 Dec., 1958; 8.00 a.m. to 2.30 p.m.; temp. 12° to 23°; wind, none; 2 to 4 feet of snow. 7 observers in 3 parties. Total party hours, 14 (10 on foot, 4 by car); total party miles, 22 (12 on foot, 10 by car).

Glaucous Gull, 4; Iceland Gull, 46 (including 24 Thayer's Gulls); Great Black-backed Gull, 56; Herring Gull, 297; Rock Dove, 301; Yellow-shafted Flicker, 10; Common Raven, 42; Common Crow, 316; Black-capped Chickadee, 7; Boreal Chickadee, 16; Am. Robin, 216; Golden-crowned Kinglet, 5; Northern Shrike, 1; Starling, 1814; House Sparrow, 408; Evening Grosbeak, 23; Purple Finch, 83; Pine Grosbeak, 30; Common Redpoll, 30; Red Crossbill, 24; White-winged Crossbill, 20. Total, 21 species; 3707 individuals.

Geoffrey Hiscock, Harold Horwood, John Macgillivray, Rev. A. M. Old, Charles Richardson, Leslie M. Tuck (compiler), Wayne Tuck (Newfoundland Natural History Society).

PRINCE EDWARD ISLAND

Mt. Stewart, P.E.I. (Hillsborough River and southern edge between Mt. Stewart and Cherry Hill; river frozen over; open water in many warm springs; 13 inches of snow in woods).—23 Dec., 1958; 8.00 a.m. to 3.30 p.m.; fine and sunny; temp. 10° to 25°; wind, 10-20 m.p.h. 1 observer. Total party hours, 7½ (7 on foot, ½ by car); total party miles, 10½ (6½ on foot, 4 by car).

Black Duck, 42; Green-winged Teal, 1; Common Goldeneye, 3; Common Merganser, 50; Gray Partridge, 7; Great Black-backed Gull, 4; Hairy Woodpecker, 2; Blue Jay, 8; Common Raven, 2; Common Crow, 7; Black-capped Chickadee, 13; Boreal Chickadee, 8; Golden-crowned Kinglet, 1; Starling, 14; House Sparrow, 23; White-winged Crossbill, 1; Tree Sparrow, 2; Snow Bunting, 38. Total, 18 species; 227 individuals.

Bruce C. Pigot.

NOVA SCOTIA

Cole Harbour—Chezzetcook, N.S. (15-mile circle centered on Mineville; Eastern Shore Highway, Porter's Lake, Cole Harbour, Wedge Island, Lawrencetown, Three-fathom Harbour, Seaforth and Chezzetcook; mixed woods 45%, salt water 30%, fresh water 10%, salt and brackish marsh 10%, farms and settlements 5%).—27 Dec., 1958; 7.45 a.m. to 4.30 p.m.; temp. 18° to 25°; wind NW, 10-5 m.p.h.; cloudy in a.m., then sunny; lakes and small inlets frozen; 12 inches of snow on ground; visibility over sea poor. 12 observers in 4 parties. Total party hours, 38 (12 on foot, 26 by car); total party miles, 135 (26 on foot, 109 by car).

Common Loon, 2; Red-necked Grebe, 1; Horned Grebe, 17; Canada Goose, 290; Mallard, 1; Black Duck, 440; Pintail, 1; Greater Scaup, 150; Common Goldeneye, 64; Bufflehead, 9; Oldsquaw, 36; Common Eider, 17; White-winged Scoter, 5; Common Scoter, 3; Common Merganser, 5; Red-breasted Merganser, 21; ducks, sp., 370; Sharp-shinned Hawk, 1; Bald Eagle, 1; Ruffed Grouse, 3; Purple Sandpiper, 6; Great Black-backed Gull, 41; Herring Gull, 725; Ring-billed Gull, 4; Black-headed Gull, 18; Thick-billed Murre, 1; Dovekie, 4; Hairy Woodpecker, 4; Gray Jay, 8; Blue Jay, 8; Common Raven, 66; Common Crow, 110; Black-capped Chickadee, 44; Boreal Chickadee, 18; White-breasted Nuthatch, 1; Red-breasted Nuthatch, 2; Am. Robin, 1; Golden-crowned Kinglet, 6; Starling, 220; House Sparrow, 61; Common Grackle, 2; Brown-headed Cowbird, 23; Evening Grosbeak, 1; Pine Grosbeak, 1; White-winged Crossbill, 1; Slate-colored Junco, 85; Tree Sparrow, 4; Swamp Sparrow, 1; Song Sparrow, 16; Snow Bunting, 8. Total, 49 species; about

2927 individuals. Seen during the count period but not on the count day: Sanderling, Horned Lark, Red-winged Blackbird.

B. W. Allen, C. R. K. Allen, John Comer, Ronald Dicks, Fred Dobson, Mrs. John W. Dobson, David McCarter, J. A. McCarter, Ian Macpherson, L. B. Macpherson (compiler), H. P. Moffatt, T. F. T. Morland (Nova Scotia Bird Society).

Halifax, N.S. (15-mile circle centered on Henry Lake, Old Sambro Road, city, harbor, Northwest Arm, roads to Herring Cove, Sambro, Prospect and Timberlea; mixed second-growth woods, conifer 50%, open barrens 15%, salt water 15%, fresh water 7%, small farms 7%, city and villages 6%).—28 Dec., 1958; 8.00 a.m. to 4.00 p.m.; overcast then snow; temp. 27° to 33°; wind, none; lakes and inlets frozen, 12 inches of old snow, visibility very poor. 9 observers in 7 parties. Total party hours, 28 (8 on foot, 20 by car); total party miles, 93 (16 on foot, 77 by car). In addition, 10 observers at feeding stations.

Common Loon, 3; Red-necked Grebe, 2; Horned Grebe, 7; Great Cormorant, 1; Canada Goose, 67; Common Goldeneye, 38; Oldsquaw, 12; Common Eider, 3; White-winged Scoter, 2; Red-breasted Merganser, 4; Pigeon Hawk, 1; Glaucous Gull, 1; Iceland Gull, 7; Great Black-backed Gull, 520; Herring Gull, 4200; Black-headed Gull, 3; Ring-billed Gull, 4; Dovekie, 4; Rock Dove, 750; Hairy Woodpecker, 2; Downy Woodpecker, 6; Horned Lark, 2; Gray Jay, 2; Blue Jay, 24; Common Raven, 6; Common Crow, 42; Black-capped Chickadee, 26; Boreal Chickadee, 2; Mockingbird, 1; Am. Robin, 11; Starling, 7500; House Sparrow, 2500; Red-winged Blackbird, 1; Common Grackle, 5; Brown-headed Cowbird, 70; Evening Grosbeak, 44; Slate-colored Junco, 15; Song Sparrow, 2; Snow Bunting, 7. Total, 39 species; about 15897 individuals. Seen during the count period but not on the count day: Sharp-shinned Hawk, Purple Finch, Am. Goldfinch, Fox Sparrow.

C. R. K. Allen, Mrs. G. P. Backman, Mrs. E. A. Bell, Mrs. Walter Black, Walter Chute, Mrs. Arthur Coffill, John Comer, Fred Dobson, Mrs. John Doull, Miss Alice Falkenham, Mrs. Eric McN. Grant, R. A. Kanigsberg, Gordon Larkin, L. B. Macpherson (compiler), Mrs. L. B. Macpherson, William Menchions, W. J. Mills, T. F. T. Morland and Mrs. C. L. Torey (Nova Scotia Bird Society).

West Middle Sable, N.S. (West Middle Sable to Hemeon Head and Matthews Lake; mixed woods, largely coniferous 57%, ocean shore 10%, sheltered brackish water 10%, sand beach 8%, scattered rural community 15%).—27 Dec., 1958; 7.30 a.m. to 5.00 p.m.; 96% cloudy; temp. 7° to 28°; wind N to W, 0-5 m.p.h.; snow 0 at ocean to 10 in. inland; lakes and shallow arms of sea frozen. 4 observers in 1 party. (1 active, 3 at feeding-stations). Total party hours, 9½ (active only), on foot; total party miles, 15 (on foot).

Common Loon, 2; Red-necked Grebe, 4; Horned Grebe, 3; Great Cormorant, 52; Canada Goose, 56; Black Duck, 300; Greater Scaup, 110; Common Goldeneye, 28; Bufflehead, 21; Oldsquaw, 5; Common Eider, 16; Common Merganser, 2; Red-breasted Merganser, 23; Great Black-backed Gull, 8; Herring Gull, 225; Hairy Woodpecker, 2; Horned Lark, 4; Gray Jay, 7; Blue Jay, 13; Common Raven, 2; Common Crow, 26; Black-capped Chickadee, 2; Winter Wren, 1; Starling, 47; House Sparrow, 20; Red-winged Blackbird, 3; Brown-headed Cowbird, 10; Slate-colored Junco, 12; White-throated Sparrow, 2; Song Sparrow, 2. Total, 30 species; 1008 individuals. Additional species seen during count period: Common Snipe, Downy Woodpecker, Boreal Chickadee, Robin, Tree Sparrow, Snow Bunting.

Betty Dingwall, Harrison F. Lewis (compiler), Laura N. Lewis, Mrs. Cecil Thompson.

Wolfville, N.S. (Within a radius of approximately 10 miles of Acadia University, west to Kentville; south to Black River; east to Avonport; and north to Pereau).—27 Dec., 1958; partly clear, partly overcast; temp. 22° at start, 26° later; ground covered with about 14 inches of snow; visibility excellent; light west wind. 10 observers in 4 parties (2 at bird feeding stations). Total party hours, 18; total party miles, 104 (91 by car, 13 on foot).

Mallard, 2; Black Duck, 76; Green-winged Teal, 12; Common Goldeneye, 82; Common Merganser, 2; Sharp-shinned Hawk, 2; Red-tailed Hawk, 6; Rough-legged Hawk, 1; Bald Eagle, 7; Ring-necked Pheasant, 70; Gray Partridge, 28; Great Black-

backed Gull, 32; Herring Gull, 1125 (est.); Rock Dove, 31; Yellow-shafted Flicker, 1; Hairy Woodpecker, 1; Downy Woodpecker, 2; Horned Lark, 25; Blue Jay, 49; Common Raven, 32; Common Crow, 168; Black-capped Chickadee, 10; Boreal Chickadee, 4; White-breasted Nuthatch, 1; Am. Robin, 4; Golden-crowned Kinglet, 2; Starling, 300 (est.); House Sparrow, 400 (est.); Common Grackle, 1; Brown-headed Cowbird, 1; Evening Grosbeak, 68; Purple Finch, 7; Pine Grosbeak, 42; Pine Siskin, 11; Am. Goldfinch, 27; Slate-colored Junco, 98; Song Sparrow, 6; Lapland Longspur, 12; Snow Bunting, 25. Total, 39 species; 2773 individuals. For the first time in many consecutive years no Common (Wilson's) Snipe was present in accustomed winter haunts.

Sherman Bleakney, Ruth Davidson, J. S. Erskine, Mary Forbes, Margaret Miller, Ralph Mosher, Eric Mullen, Ann Sexton, Peter Smith, R. W. Tufts (compiler).

NEW BRUNSWICK

Port Elgin, N.B. (Including Baie Verte, Port Elgin, Hardy, Woodside, Shemogue; all within $7\frac{1}{2}$ -mile radius of school at Woodside; open fields and apple orchards bordering highway 30%, salt-water marshes 30%, beach at Baie Verte 30%, coniferous forest 10%).—29 Dec., 1958; 10.00 a.m. to 5.00 p.m.; overcast; temp. 32° to 40° ; wind, none in a.m., very light in late p.m.; ground covered with 12 to 18 inches of snow; all fresh water areas frozen over, most of Baie Verte frozen over. 4 observers in 1 party. Total party hours, 28 (10 on foot, 18 by car); total party miles, 40 (10 on foot, 30 by car).

Oldsquaw, 3; Ruffed Grouse, 1; Blue Jay, 11; Common Raven, 61; Common Crow, 36; Black-capped Chickadee, 10; Starling, 88; House Sparrow, 54; Slate-colored Junco, 3; Tree Sparrow, 107; Snow Bunting, 20. Total, 11 species; 394 individuals. Five Rough-legged Hawks were observed by the party on the Tantramar marshes near Sackville while proceeding to the census area.

Charles Bartlett (compiler), Albert Flemming, Francis Premdas, Stephen Seepersad.

Saint John, N.B. (Saint John, Lancaster, Rothesay, tidal waters of lower Saint John and Kannebecasis rivers, harbor and seashore. Part covered was 20% sea coast, 70% city and residential area, 10% mixed woods).—27 Dec., 1958; 7.30 a.m. to 5.00 p.m.; temp. -5° to 15° ; wind NW, almost calm. 13 observers in 6 parties. Total party hours, 48 (19 on foot, 9 by car); total party miles, 54 (14 on foot, 40 by car).

Common Loon, 1; Black Duck, 26; Common Goldeneye, 144; Red-breasted Merganser, 5; Sharp-shinned Hawk, 2; Ruffed Grouse, 1; Gray Partridge, 13; Great Black-backed Gull, 221; Herring Gull, 2091; Rock Dove, 72; Hairy Woodpecker, 2; Downy Woodpecker, 10; Blue Jay, 2; Common Raven, 57; Common Crow, 243; Black-capped Chickadee, 53; Boreal Chickadee, 3; White-breasted Nuthatch, 1; Golden-crowned Kinglet, 5; Starling, 166; House Sparrow, 98; Am. Goldfinch, 2; Slate-colored Junco, 6; Tree Sparrow, 10; Snow Bunting, 12. Total, 25 species; about 3079 individuals. Seen during count period: Am. Robin, White-winged Crossbill, White-throated Sparrow, Song Sparrow.

Mrs. C. H. Brock, David Christie, Mrs. C. S. Christie, Miss F. Christie, Miss L. Christie, G. Eagles, Roy E. Forrester, Miss Jane Hazen, Eric Lawrence, Mrs. Eric Lawrence, R. Squires, W. Austin Squires (compiler), Murray Watters.

Welsford-Bailey, N.B. ($7\frac{1}{2}$ -mile radius centered on Enniskillen, including area on Highway 28 from Douglas Lake to Central Blissville P.O.; part covered 63% coniferous forest, 34% fields and farmland, 3% deciduous forest and other).—31 Dec., 1958; 10.30 a.m. to 5.10 p.m.; sunny; temp. 18° to 20° ; wind NNW, 10-20 m.p.h.; ground covered with 8 to 10 inches of crusted snow; streams and lakes frozen. 1 observer. Total party hours, $6\frac{1}{2}$ ($3\frac{1}{2}$ on foot, 3 by car); total party miles, $26\frac{1}{2}$ (3 on foot, $23\frac{1}{2}$ by car).

Bald Eagle, 1; Blue Jay, 7; Common Crow, 1; Black-capped Chickadee, 28; Boreal Chickadee, 10; Red-breasted Nuthatch, 6; Winter Wren, 1; Golden-crowned Kinglet, 1; White-winged Crossbill, 4; Tree Sparrow, 2; Snow Bunting, 60. Total, 11 species; 121 individuals. Seen in area during count period: Ruffed Grouse, Pileated

Woodpecker, Hairy Woodpecker, Black-backed Three-toed Woodpecker, Pine Grosbeak, Am. Goldfinch.

David S. Christie.

QUEBEC

Grand'Mere, Que. (Wooded area near town).—21 Dec., 1958; 2.30 to 4 p.m.; temp. —20°; wind, none. 2 observers in 1 party. Total party hours, 3 (1 on foot); total party miles, 1 (on foot).

Hairy Woodpecker, 2; Downy Woodpecker, 3; Blue Jay, 6; Common Raven, 1; Black-capped Chickadee, 8; Red-breasted Nuthatch, 5; Brown Creeper, 1. Total, 7 species; 26 individuals.

R. E. Kirkpatrick.

Hudson Heights, Que. (Residential area, fields and woods, golf course sanctuary).—21 Dec., 1958; 7.30 a.m. to 4.00 p.m.; sunny; temp.—10° to 0°; wind NW, 10-15 m.p.h., gusts to 20 m.p.h.; lake and streams all frozen. 24 observers in 10 parties. Total party hours, 45 (20 on foot, 8 on skis, 12 at feeders, 5 by car); total party miles, 88 (16 on foot, 7 on skis, 65 by car).

Ruffed Grouse, 1; Rock Dove, 8; Pileated Woodpecker, 1; Hairy Woodpecker, 7; Downy Woodpecker, 10; Blue Jay, 70; Black-capped Chickadee, 169; White-breasted Nuthatch, 22; Red-breasted Nuthatch, 1; Brown Creeper, 2; Cedar Waxwing, 8; Starling, 64; House Sparrow, 111; Common Grackle, 1; Brown-headed Cowbird, 1; Evening Grosbeak, 3; Purple Finch, 1; Pine Grosbeak, 19; Common Redpoll, 18; Am. Goldfinch, 15; White-winged Crossbill, 32; Rufous-sided Towhee, 1; Slate-colored Junco, 2; Tree Sparrow, 19. Total, 24 species; 586 individuals.

Lars Anderson, Ole Anderson, Mrs. A. Bryan, Mr. and Mrs. E. R. Chambers, Miss A. Clarke, Mrs. H. Conner, Mr. and Mrs. R. Cundill, Mr. and Mrs. G. A. Golden (compiler), Dr. A. Hickey, A. Kelly, R. Lepingwell, D. Macaulay, H. Marpole, Mrs. D. Mullan, Mrs. G. Riley, J. Robinson, E. Smith, Mrs. J. Smythe, Miss J. Sweeney, Mrs. R. W. Wright, Abbott Wright.

Lennoxville, Que. (Open fields and hedgerows along half-mile of Magog River; and 106 miles of roads close to mixed second growth woods; four woods, from mature hemlock to birch scrub, totaling 1 sq. mile; 10 acres of Lake Massawippi; 14 feeding stations in Lennoxville and North Hatley; all within a circle with critical 15-mile diameter extending from Magog city power dam to just beyond Lennoxville. 27 Dec., 1958; 7.30 a.m. to 4.00 p.m.; light snow to afternoon, clearing; temp. 22° to 28°; wind SE 2 m.p.h. to E 3 m.p.h.; ground with a little over one foot of snow, very little open water. 12 observers in 3 to 2 parties and 13 stationary observers at feeders, 7 observers only for full day. Reporting maximum number, chiefly from 8.00 to 9.00 a.m. Total party hours, 30 (11½ on foot, 5½ by car, 13 at feeders); total party miles, 113½ (7½ on foot, 106 by car).

Common Goldeneye, 150; Barrow's Goldeneye, 4; Hooded Merganser, 5; Common Merganser, 129; Ruffed Grouse, 1; Herring Gull, 9; Hairy Woodpecker, 12; Downy Woodpecker, 9; Blue Jay, 67; Common Crow, 3; Black-capped Chickadee, 115; White-breasted Nuthatch, 16; Red-breasted Nuthatch, 2; Brown Creeper, 1; Starling, 73; House Sparrow, 159; Evening Grosbeak, 134; Purple Finch, 1; Pine Grosbeak, 20; Pine Siskin, 36; Am. Goldfinch, 3; White-winged Crossbill, 57; Tree Sparrow, 17. Total, 23 species; 1023 individuals. Seen in area Dec. 26, 7 Snow Buntings.

Mrs. D. M. Bennett, Mrs. G. E. Bennett, G. Biard, Mr. and Mrs. A. P. Campbell, C. L. Cate, Mr. and Mrs. F. Clowery, H. Doheny, Mrs. H. S. Horsfall, W. Knight, R. Knight, A. Kruming, A. N. Langford (compiler), Miss E. LeBaron, F. G. LeBaron, D. Patriquin, Mr. and Mrs. J. G. Patriquin, Mrs. F. R. Pattison, Mrs. G. A. St. Pierre, Mrs. E. B. Sims, K. Y. Stanton, Mrs. H. N. Welsh, Mrs. J. York.

Montreal, Que. (Circle of 15-mile diameter with center at intersection of Sherbrooke St. W. and Decarie Blvd.; St. Lawrence River, islands and inland parks).—27 Dec., 1958; 8 a.m. to 4 p.m.; temp. 20° to 28°; wind W, 5 m.p.h. 30 observers in 6 parties. Total party hours, 28 (18 on foot, 10 by car); total party miles, 105 (16 on foot, 89 by car).

Mallard, 3; Black Duck, 90; Greater Scaup, 2; Common Goldeneye, 583; Common Merganser, 248; Rough-legged Hawk, 1; Sparrow Hawk, 2; Ring-necked Pheasant,

15; Gray Partridge, 11; Rock Dove, 118; Snowy Owl, 1; Hawk Owl, 1; Barred Owl, 1; Short-eared Owl, 1; Yellow-shafted Flicker, 4; Hairy Woodpecker, 3; Downy Woodpecker, 19; Blue Jay, 1; Common Crow, 11; Black-capped Chickadee, 20; White-breasted Nuthatch, 4; Am. Robin, 4; Cedar Waxwing, 4; Starling, 1200; House Sparrow, 495; Purple Finch, 2; Pine Grosbeak, 2; Common Redpoll, 30; Tree Sparrow, 31; Song Sparrow, 2; Snow Bunting, 16. Total, 31 species; 2925 individuals.

Miss T. Bergeron, Mr. and Mrs. J. Black, Dr. W. F. Black, R. Brisebois, Mrs. H. E. Chalk, J. D. Delafield, E. Hawkins (compiler), Miss G. Hibbard, Dr. A. Hickey, A. Holland, A. W. B. Kelly, A. R. Lepingwell, Bro. Mathias, D. Mess, Mr. Justice Montgomery, Mrs. M. O. Montgomery, J. M. Montgomery, Mrs. A. Reekie, Mrs. Roberts, J. W. Robinson, J. A. Rolland, D. Ryan, L. Segal, D. E. Sergeant, Dr. J. Summerby, Mr. and Mrs. D. Westorborg, R. Yates.

Quebec, Que. (Ste. Foy and St. Augustin to Quebec bridge, Quebec seaport to Island of Orleans bridge, Plains of Abraham, Charlesborough, Orsainville, Quebec Zoological Garden; suburbs 16%, fields 22%, coniferous forests 8%, deciduous woods 6%, mixed woodlands 38%, shores 10%).—26 Dec. 1958; 7 a.m. to 4 p.m.; cloudy, light snow; temp.—7° to 10°; wind NW, 1-3 m.p.h.; 20-24 inches of snow on ground, streams partly open but very abundant icefields on St. Lawrence River. 19 observers in 7 parties. Total party hours, 45 (41 on foot, 4 by car); total party miles, 59 (34 on foot, 25 by car).

Cooper's Hawk, 1; Ruffed Grouse, 2; Hairy Woodpecker, 5; Downy Woodpecker, 4; Blue Jay, 18; Common Crow, 2; Black-capped Chickadee, 49; White-breasted Nuthatch, 4; Red-breasted Nuthatch, 7; Am. Robin, 1; Cedar Waxwing, 3; Northern Shrike, 1; Starling, 373; House Sparrow, 314; Evening Grosbeak, 99; Pine Grosbeak, 259; Common Redpoll, 63; White-winged Crossbill, 6; Slate-colored Junco, 1; Tree Sparrow, 1. Total, 20 species; 1213 individuals. Seen in area, Dec. 29, 1 Pigeon Hawk, by R.L. and Dec. 28, 3 Snow Buntings.

Benoît Asselin, Guy Breton, Jacques Cayouette, Raymond Cayouette (compiler), Pierre Dumais, Rolland Dumais, Paul Germain, Miss Lise Henry, Jean Huot, Louis Lemieux, Gaston Lepage, Ronald Lepage, Denis Lever, Louis-A. Lord, Gaston Moisan, André Robert, Jean-Marc Robert, René St-Laurent, Rev. Paul-E. Sirois (Club des Ornithologues).

Vale Perkins, Que. (Mostly roadside, some woods, mountainous country).—27 Dec., 1958; 10 to 12 a.m. and 1 to 4 p.m.; 28° to 30°; wind N, slight. 2 observers in 2 parties. Total party hours, 5 (on foot); total party miles, 3 (on foot).

Ruffed Grouse, 2; Hairy Woodpecker, 3; Blue Jay, 12; Black-capped Chickadee, 6; Red-breasted Nuthatch, 1; Pine Grosbeak, 50; Common Redpoll, 2; Pine Siskin, 30. Total, 8 species; 106 individuals.

Mrs. Leverett Jewett, Miss Claudia Jewett, Mrs. Eric Sullivan (compiler).

ONTARIO

Bancroft, Ont. (Paudash Lake north on Highway 28 to Bancroft).—23 Dec., 1958; 8 a.m. to 4 p.m.; temp 32° to 26°; no wind; overcast; 15 to 20 inches snow. 2 observers in 1 party. Total party hours, 8 (5 on foot, 3 by car); total party miles, 76 (4 on foot, 72 by car).

Pileated Woodpecker, 1; Hairy Woodpecker, 9; Downy Woodpecker, 6; Blue Jay, 64; Black-capped Chickadee, 41; White-breasted Nuthatch, 8; Red-breasted Nuthatch, 9; Starling, 1; House Sparrow, 16; Evening Grosbeak, 27; Purple Finch, 1; Pine Grosbeak, 34; Pine Siskin, 2; White-winged Crossbill, 27; Tree Sparrow, 2; Snow Bunting, 32. Total, 16 species; 280 individuals.

Douglas Scovell, Earl Stark (compiler) (Toronto Ornithological Club).

Barrie, Ont. (City of Barrie and approximately 7 to 8 miles in all directions, 80% farmland, 10% hardwood bush, 5% swamp, 5% city, villages, etc., 12 miles of lake front frozen over).—27 Dec., 1958; 8.30 a.m. to 5.00 p.m.; temp. 20° to 35°; wind NW, 13 m.p.h. 28 observers in 6 parties. Total party hours, 37½ (15½ on foot, 22 by car); total party miles, 313 (13 on foot, 300 by car).

Cooper's Hawk, 1; Red-tailed Hawk, 2; Sparrow Hawk, 2; Ruffed Grouse, 8; Herring Gull, 6; Rock Dove, 20; Pileated Woodpecker, 2; Hairy Woodpecker, 9; Downy Woodpecker, 19; Blue Jay, 101; Common Crow, 2; Black-capped Chickadee, 123; White-breasted Nuthatch, 15; Red-breasted Nuthatch, 1; Brown Creeper, 2; Am. Robin, 5; Golden-crowned Kinglet, 2; Bohemian Waxwing, 116; Cedar Waxwing, 41; Northern Shrike, 7; Starling, 128; House Sparrow, 86; Cardinal, 1; Evening Grosbeak, 169; Pine Grosbeak, 23; Am. Goldfinch, 90; Rufous-sided Towhee, 1; Slate-colored Junco, 19; Oregon Junco, 1; Tree Sparrow, 120; White-crowned Sparrow, 1; White-throated Sparrow, 1; Snow Bunting, 205. Total, 33 species; 1329 individuals. Seen in count period: Common Merganser, Ring-necked Pheasant.

Jimmie Barr, Mr. and Mrs. W. A. Bell, Mrs. Childs, Grace Crooks, Hugh Currie, Eve Fisher, Mr. and Mrs. R. Freeman, Art Fuller, Peter Gray, Fred Helleiner, Anastasia Hughes (compiler), Gordon Johns, Michael Lumsden, Ken MacDonald, Harry Morren, Madge Pearce, Rosemary Pearce, Harold Richards, Hope Ronald, A. Segond, J. Segond, Eola Scott, Jean Sheppard, Beverly Westman, Mr. and Mrs. J. Westman.

Brockville, Ont. (Area inside a 7½-mile radius of the post office of Brockville. Including all of the St. Lawrence River found within area. Almost one half of area is in New York State. 50% open farmland, 20% deciduous woodland, 7% coniferous, 1½% marsh, 1½% urban).—28 Dec., 1958; 8.00 a.m. to 4.30 p.m.; temp. 30° to 25°; wind SW, 10 m.p.h.; generally overcast with cloud at 3000 to 5000 feet; clearing in the afternoon. 12 observers in 7 parties. Total party hours, 51½ (25 on foot, 26½ by car); total party miles, 197½ (27½ on foot, 170 by car).

Black Duck, 117; Canvasback, 100; Common Goldeneye, 434; Common Merganser, 508; Bald Eagle, 1; Sparrow Hawk, 1; Ruffed Grouse, 2; Great Black-backed Gull, 3; Herring Gull, 230; Ring-billed Gull, 1; Pileated Woodpecker, 3; Hairy Woodpecker, 15; Downy Woodpecker, 26; Blue Jay, 75; Common Crow, 2; Black-capped Chickadee, 243; White-breasted Nuthatch, 30; Red-breasted Nuthatch, 2; Brown Creeper, 3; Golden-crowned Kinglet, 2; Northern Shrike, 3; Starling, 314; House Sparrow, 429; Evening Grosbeak, 96; Purple Finch, 3; Pine Siskin, 8; Am. Goldfinch, 9; Slate-colored Junco, 5; Tree Sparrow, 191; Song Sparrow, 4; Snow Bunting, 300. Total, 31 species; 3150 individuals. Other species seen in the area during the count period but not on the day of the census include: American Robin, Black-backed Three-toed Woodpecker, Gray Partridge.

Mr. and Mrs. Walter Ashworth, James Bayly (compiler), Kenneth Buell, Miss Mary Hewitt, David Hurrie, Miss Barbara Jarvie, Mrs. Ivy Jarvie, Matthew Jarvie, Howard Lapp, Alden Strong, Miss Deirdre Webb.

Carleton Place, Ont. (7½-mile radius circle on center of town).—27 Dec., 1958; 9 a.m. to 2.30 p.m.; temp. 16° to 26°; wind, light, 0-6 m.p.h. 30 observers in 10 parties. Total party hours, 50; total party miles, 230 (20 on foot, 210 by car).

Canada Goose, 1; Black Duck, 2; Common Goldeneye, 18; Hooded Merganser, 1; Common Merganser, 1; Ruffed Grouse, 5; Gray Partridge, 3; Rock Dove, 133; Pileated Woodpecker, 1; Hairy Woodpecker, 10; Downy Woodpecker, 4; Blue Jay, 117; Common Crow, 10; Black-capped Chickadee, 91; White-breasted Nuthatch, 16; Brown Creeper, 3; Northern Shrike, 1; Starling, 242; House Sparrow, 475; Evening Grosbeak, 173; Pine Grosbeak, 109; Common Redpoll, 22; Pine Siskin, 90; Am. Goldfinch, 21; Red Crossbill, 8; Tree Sparrow, 26; White-throated Sparrow, 2; Snow Bunting, 269. Total, 28 species; 1854 individuals.

Garry Aitkin, Jimmy Bartley, Russell Beeman, Alan Bland, Howard Brown, Dianne Burnett, Miss Sheila Clark, Mrs. (Dr.) Church, Anna Findlay, Dan. Findlay, Mr. (compiler) and Mrs. D. D. Findlay, D. Hamilton Findlay, George E. Findlay, Peter Findlay, Sheila Findlay, Timothy Findlay, William Findlay, Rowley Frith, H. C. Hodgson, Cyril Inderwick, Bruce, Kennedy, Robert Lighthart, Gordon Maybee, Peter and Mrs. Richardson, E. H. Ritchie, Michael Spencer, Douglas Stewart, H. R. Sykes, Mrs. Hubert Wilson.

Collingwood, Ont. (Lake and lake shore areas, wooded locations and open country, some residential areas in town).—27 Dec., 1958; 9 a.m. to 3.30 p.m.; temp. 25° to 30°; wind

SW, 10-15 m.p.h. 4 observers in two parties. Total party hours, 7; total party miles, 15 (3 on foot, 12 by car).

Horned Grebe, 1; Common Goldeneye, 23; Bufflehead, 6; Harlequin Duck, 2 (first record for Simcoe County); Common Merganser, 12; Cooper's Hawk, 1; Ruffed Grouse, 1; Glaucous Gull, 1; Herring Gull, 1,000; Rock Dove, 50; Downy Woodpecker, 3; Horned Lark, 12; Blue Jay, 8; Black-capped Chickadee, 22; White-breasted Nuthatch, 2; Am. Robin, 25; Golden-crowned Kinglet, 5; Bohemian Waxwing, 60; Cedar Waxwing, 75; Northern Shrike, 1; Starling, 80; House Sparrow, 300; Cardinal, 3; Evening Grosbeak, 22; Purple Finch, 2; Pine Siskin, 30; Am. Goldfinch, 18; Slate-colored Junco, 6; Tree Sparrow, 16; Snow Bunting, 75. Total, 30 species; 1769 individuals.

A. J. Mitchener (compiler), Mr. and Mrs. L. Wambold, Douglas Wambold.

Hamilton, Ont. ($\frac{7}{8}$ -mile radius centering on York and Dundurn Streets, including Hamilton, Burlington, Waterdown, Dundas, Greensville, Ancaster, Mineral Springs, Southcote, Hannon and Stoney Creek; pasture 10%, plowed land 20%, old fields 15%, orchards 5%, towns and suburbs 10%, mixed woods 30%, marshes 5%, open water 5%).—28 Dec., 1958; 7.15 a.m. to 5.30 p.m.; sunny; temp. 32° to 46°; S to E, 2-7 m.p.h.; 1 to 4 inches of old snow on ground, most streams and Hamilton Harbor frozen over. 63 observers in 30 parties. Total party hours, 169 (147 on foot, 22 by car); total party miles, 448 (235 on foot, 213 by car).

Mallard, 39; Black Duck, 140; Redhead, 5; Ring-necked Duck, 1; Canvasback, 11; Greater Scaup, 250; Lesser Scaup, 1; Common Goldeneye, 175; Bufflehead, 12; Oldsquaw, 600; King Eider, 2; White-winged Scoter, 275; Common Merganser, 207; Red-breasted Merganser, 17; Red-tailed Hawk, 77; Rough-legged Hawk, 8; Marsh Hawk, 1; Pigeon Hawk, 1; Sparrow Hawk, 33; Ruffed Grouse, 10; Ring-necked Pheasant, 89; Gray Partridge, 14; Common Snipe, 1; Glaucous Gull, 1; Great Black-backed Gull, 32; Herring Gull, 1500; Ring-billed Gull, 10; Rock Dove, (not counted); Mourning Dove, 4; Screech Owl, 1; Great Horned Owl, 7; Long-eared Owl, 28; Belted Kingfisher, 3; Yellow-shafted Flicker, 4; Pileated Woodpecker, 1; Hairy Woodpecker, 51; Downy Woodpecker, 158; Black-capped Three-toed Woodpecker, 1; Horned Lark, 20; Blue Jay, 213; Common Crow, 380; Black-capped Chickadee, 366; White-breasted Nuthatch, 43; Red-breasted Nuthatch, 14; Brown Creeper, 72; Winter Wren, 6; Carolina Wren, 2; Brown Thrasher, 1; Am. Robin, 10; Golden-crowned Kinglet, 145; Ruby-crowned Kinglet, 2; Cedar Waxwing, 203; Northern Shrike, 3; Starling, 3100; Myrtle Warbler, 1; Yellowthroat, 1; House Sparrow, 1570; Eastern Meadowlark, 1; Redwinged Blackbird, 8; Rusty Blackbird, 7; Common Grackle, 5; Brown-headed Cowbird, 5; Cardinal, 193; Evening Grosbeak, 3; Purple Finch, 15; Common Redpoll, 19; Pine Siskin, 36; Am. Goldfinch, 620; Rufous-sided Towhee, 1; Slate-colored Junco, 610; Tree Sparrow, 716; Field Sparrow, 2; White-throated Sparrow, 2; Swamp Sparrow, 7; Song Sparrow, 157; Lapland Longspur, 8; Snow Bunting, 29. Total, 77 species; about 12,366 individuals. Seen in count period: Horned Grebe, Harlequin Duck, Hooded Merganser, Cooper's Hawk, Am. Coot, Snowy Owl, Catbird.

Paul Baird, Eric W. Bastin, Frank V. Bell, Mrs. Jean Bourne, Mrs. Etta Bourne, Neil Bourne, R. D. F. Bourne, James Burns, William I. Campbell, Kenneth J. Cox, John Cumming, Robert Curry, Peter Demulder, Ted Dinniwel, James A. N. Dowall, Vincent Duff, Robert O. Elstone, W. A. T. Gilmour, Leslie A. Gray, Peter Hamel, Mrs. Audrey Hawkes, Dr. Peter F. Henderson, Ralph Idema, Angus B. Jackson, Roger Jackson, John D. Johnstone, Miss Margaret Lamb, Woodburn Lambe, Mrs. Alice Lamoureux, John Lamoureux, Miss A. LeWarne, Suzanne Lawrie, Thomson C. Lawrie, Robert H. Lloyd, Ray Lowes, Dr. Robert MacLaren, George V. McBride, C. Douglas McCallum, Dr. George O. McMillan, John Miles, Mrs. Dorothy Jane Miller, Dr. John J. Miller, Mrs. G. Moes, Mrs. Carl M. Morden, James Morrow, Dougald Moule, John A. Moule, Albert B. Nind, George W. North (compiler), John North, Mrs. Laurel E. North, R. J. B. North, Ronald North, Mrs. H. C. Nunn, John Olmsted, David K. Powell, Robert K. Sargeant, Douglas Smith, Robert Stamp, Miss Laura A. Stewart, Miss Mabel Watson, J. Harvey Williams, Edward Woods (Hamilton Naturalists' Club).

Huntsville, Ont. (25-mile radius from town of Huntsville; typical mixed forest of Great Lakes-St. Lawrence association, containing one town and some half-dozen villages;

about 10% farmland; no open water, except on fast-flowing streams).—28 Dec., 1958; 8 a.m. to 5 p.m.; cloudy; temp. 32° to 36°; wind, none; 16 inches of snow, 35 observers in 12 parties. Total party hours, 33½; total party miles, 204 (22 on foot, 182 by car).

Common Goldeneye, 15; Ruffed Grouse, 21; Herring Gull, 1; Pileated Woodpecker, 8; Hairy Woodpecker, 42; Downy Woodpecker, 40; Black-backed Three-toed Woodpecker, 3; Gray Jay, 2; Blue Jay, 242; Common Raven, 5; Black-capped Chickadee, 298; White-breasted Nuthatch, 45; Red-breasted Nuthatch, 28; Brown Creeper, 5; Northern Shrike, 1; Starling, 219; House Sparrow, 35; Cardinal, 1; Evening Grosbeak, 135; Purple Finch, 36; Pine Grosbeak, 50; Common Redpoll, 73; Pine Siskin, 9; Am. Goldfinch, 62; White-winged Crossbill, 3; Slate-colored Junco, 1; Tree Sparrow, 1; Snow Bunting, 84. Total, 28 species; 1465 individuals.

Mrs. Edgar Brook, Mr. and Mrs. Abbott Conway, Beverley Conway, Patricia Conway, Paul Conway, Mr. and Mrs. Emerson Farnsworth, Richard Helsel, Mrs. J. M. Heron, Mrs. Gordon Hill, Mrs. Bert Horton, John Hull, James Kay, Mr. and Mrs. Gerald Keetch, Mr. and Mrs. Ross McFarland, Mrs. Esther Langridge, Aubrey May, Nancy May, Mrs. Jean Olan, Kenneth Perrin, Dr. and Mrs. H. L. Reazin, Mr. and Mrs. E. G. R. Rogers, Dr. and Mrs. Ross Rogers, R. J. Rutter (compiler), Allen Story, David Story, Mr. and Mrs. Wilfred Waters, Mrs. George Wilson (Huntsville Nature Club).

Ingersoll, Ont. (South and west of Ingersoll to Middlesex County and also the village of Harrington West).—27 Dec., 1958; 8 a.m. to 6 p.m.; rain and wet snow in afternoon, ground covered with snow, river almost completely frozen over. 4 observers in 4 parties. Total party hours, 31; total party miles, 46 (on foot).

Mallard, 1; Black Duck, 8; Common Goldeneye, 4; Cooper's Hawk, 1; Red-tailed Hawk, 5; Rough-legged Hawk, 1; Ruffed Grouse, 2; Ring-necked Pheasant, 2; Screech Owl, 1; Great Horned Owl, 4; Long-eared Owl, 1; Hairy Woodpecker, 8; Downy Woodpecker, 11; Black-backed Three-toed Woodpecker, 1; Blue Jay, 41; Common Crow, 2; Black-capped Chickadee, 91; White-breasted Nuthatch, 9; Brown Creeper, 11; Winter Wren, 1; Am. Robin, 1; Golden-crowned Kinglet, 10; Starling, 102; House Sparrow, 319; Cardinal, 48; Evening Grosbeak, 1; Purple Finch, 10; Am. Goldfinch, 222; Slate-colored Junco, 50; Tree Sparrow, 95; Song Sparrow, 21. Total, 31 species; 1084 individuals.

D. Bucknell, D. Kittmer, Mrs. B. McDiarmid, B. Parker (compiler).

Kingston, Ont. (7½-mile radius centering ¼ mile west of Garden Island, including Cataraqui River and Creek, Lake Ontario, St. Lawrence River and Wolfe Island; urban 5%, farmland 25%, about half frozen over by end of day).—20 Dec., 1958; 7.45 a.m. to 5.15 p.m.; clear, then overcast; temp. -15° to 0°; wind N, 0-5 m.p.h.; 8 inches snow on ground, freezing water "steaming" heavily. 19 observers in 6 parties. Total party hours, 52½ (18 on foot, 33 by car, 1½ by boat); total party miles, 369 (40 on foot, 323 by car, 6 by boat).

Black Duck, 9; Common Goldeneye, 72; Bufflehead, 2; Common Merganser, 59; Red-tailed Hawk, 1; Rough-legged Hawk, 4; Bald Eagle, 1; Marsh Hawk, 1; Sparrow Hawk, 6; Ruffed Grouse, 3; Gray Partridge, 66; Glaucous Gull, 1; Great Black-backed Gull, 23; Herring Gull, 300; Ring-billed Gull, 45; Snowy Owl, 2; Short-eared Owl, 10; Pileated Woodpecker, 1; Hairy Woodpecker, 3; Downy Woodpecker, 14; Blue Jay, 32; Common Crow, 6; Black-capped Chickadee, 133; White-breasted Nuthatch, 13; Brown Creeper, 6; Am. Robin, 1; Cedar Waxwing, 1; Northern Shrike, 2; Starling, 1,210; House Sparrow, 860; Redwinged Blackbird, 1; Brown-headed Cowbird, 8; Am. Goldfinch, 34; Slate-colored Junco, 13; Tree Sparrow, 124; Song Sparrow, 5; Lapland Longspur, 20; Snow Bunting, 270. Total, 38 species; about 3362 individuals. Seen in area during count period, but not on count day: Mallard, Cooper's Hawk, Kingfisher, Winter Wren, Common Grackle, Evening Grosbeak, Common Redpoll.

A. E. S. Bell, Dr. and Mrs. K. F. Edwards, Dr. M. H. Edwards (compiler), A. E. Garwood, A. E. Hyde, A. M. Hutchison, W. G. Lamb, M. L'Estrange, P. E. Little, L. H. Lowther, D. A. L. Paul, H. Quilliam, Dr. and Mrs. G. M. Stirrett, A. M. Strong, J. A. Warren, D. Webb, M. Winterink (Kingston Nature Club).

Kirkland Lake, Ont. (A circle with a $7\frac{1}{2}$ -mile radius, includes city of Kirkland Lake, and surroundings, partly cleared and partly forested with poplar, birch and evergreens).—21 Dec., 1958; 7 a.m. to 6 p.m.; temp. -5° to -25° ; wind N, 12 m.p.h. 10 observers in 3 parties. Total party hours, 25 ($8\frac{1}{2}$ on foot, $16\frac{1}{2}$ by car); total party miles, 144 ($16\frac{1}{2}$ on foot, $127\frac{1}{2}$ by car).

Common Merganser, 1; Ruffed Grouse, 3; Great Horned Owl, 1; Hairy Woodpecker, 10; Downy Woodpecker, 6; Black-backed Three-toed Woodpecker, 2; Gray Jay, 3; Blue Jay, 22; Common Raven, 14; Black-capped Chickadee, 58; Boreal Chickadee, 1; Starling, 36; House Sparrow, 14; Common Grackle, 1; Evening Grosbeak, 29; Pine Grosbeak, 31; Snow Bunting, 5. Total, 17 species; 237 individuals.

E. Cox, Mrs. R. E. Evans, Fred Helleimer, Ralph Karlson, Kenneth MacDonald, Ian Robertson, Mr. and Mrs. J. G. Stephenson, George Timmins, Jr., Frank Washington (compiler).

Kitchener, Ont. ($7\frac{1}{2}$ -mile radius centering on extreme SW boundary of Kitchener; cattail marsh 2%, open farm land and pasture 23%, deciduous woods 25%, coniferous woods 25%, swamp 21%, town suburbs 2%, open water 2%).—21 Dec., 1958; 8.00 a.m. to 4.30 p.m.; temp. 2° to 12° ; wind W, 15 m.p.h.; perfectly clear until midafternoon when some clouding over; slight snowfall, snow cover of 8-10 inches; almost all water frozen over. 15 observers in 6 parties. Total party hours, $35\frac{1}{2}$ ($23\frac{1}{2}$ on foot, $11\frac{1}{2}$ by car); total party miles, 152 (26 on foot, 126 by car).

Mallard, 36; Black Duck, 23; Common Goldeneye, 9; Common Merganser, 2; Cooper's Hawk, 1; Red-tailed Hawk, 8; Red-shouldered Hawk, 1; Sparrow Hawk, 2; Ruffed Grouse, 4; Ring-necked Pheasant, 8; Herring Gull, 2; Rock Dove, $112\pm$; Pileated Woodpecker, 1; Hairy Woodpecker, 6; Downy Woodpecker, 37; Blue Jay, 37; Black-capped Chickadee, $237+$; White-breasted Nuthatch, 15; Red-breasted Nuthatch, 2; Brown Creeper, 8; Winter Wren, 2; Golden-crowned Kinglet, 44; Cedar Waxwing, 38; Northern Shrike, 2; Starling, 76; House Sparrow, $334\pm$; Cardinal, 36; Evening Grosbeak, 52; Purple Finch, 16; Common Redpoll, 163; Pine Siskin, 4; Am. Goldfinch, 256; Slate-colored Junco, 75; Tree Sparrow, 70; Chipping Sparrow, 1; Swamp Sparrow, 1; Song Sparrow, 8; Snow Bunting, $265\pm$. Total, 38 species; $1992\pm$ individuals.

J. Bindernagel, C. A. Campbell (compiler), S. R. Campbell, H. A. Dahmer, J. R. Detweiler, F. W. R. Dickson, Miss M. Dickson, R. C. Hilborn, Miss M. Lemon, R. Pickering, Dr. J. B. Sanders, W. H. Schaefer, N. Shantz, S. Underhill, R. Wilkins.

Lindsay, Ont. (Reaboro to Bethany and Janetville, Ont.; open farmland, etc., about 80%, woods 20%).—21 Dec., 1958; 7 a.m. to 3 p.m.; temp. -15° to -2° ; wind NW, 10 to (in p.m.) 5 m.p.h.; 7 inches of snow. Total party miles, 47 (3 on foot, 44 by car).

Snowy Owl, 1; Hairy Woodpecker, 3; Downy Woodpecker, 1; Blue Jay, 6; Black-capped Chickadee, 31; Northern Shrike, 1; Starling, 10; House Sparrow, 8; Evening Grosbeak, 6; Am. Goldfinch, 7; finch (sp.?), 1; Tree Sparrow, 6; Snow Bunting, 5. Total, 13 species; 86 individuals.

David Calvert.

London, Ont. ($7\frac{1}{2}$ -mile radius of London, extending along Thames River east and west; cedar swamp 10%, pasture 10%, wood lot 15%, marsh 20%, farmland 15%, river valley 25%, town and suburbs 5%).—27 Dec., 1958; 8 a.m. to 4.30 p.m.; temp. 20° to 38° ; wind SW to W, 15-25 m.p.h.; ground covered with snow; river frozen except rapids. 17 observers in 11 parties. Total party hours, 91 (73 on foot, 18 by car); total party miles, 202 (72 on foot, 130 by car).

Great Blue Heron, 2; Canada Goose, 50; Mallard, 9; Black Duck, 335; Canvas-back, 1; Greater Scaup, 2; Common Goldeneye, 58; Hooded Merganser, 1; Common Merganser, 77; Sharp-shinned Hawk, 1; Cooper's Hawk, 3; Red-tailed Hawk, 19; Red-shouldered Hawk, 1; Rough-legged Hawk, 5; Bald Eagle, 2; Marsh Hawk, 1; Sparrow Hawk, 2; Ring-necked Pheasant, 60; Killdeer, 1; Herring Gull, 1; Mourning Dove, 67; Screech Owl, 1; Great Horned Owl, 3; Long-eared Owl, 3; Saw-whet Owl, 1; Belted Kingfisher, 4; Yellow-shafted Flicker, 3; Pileated Woodpecker, 1;

Yellow-bellied Sapsucker, 1; Hairy Woodpecker, 26; Downy Woodpecker, 129; Horned Lark, 1; Blue Jay, 123; Common Crow, 11; Black-capped Chickadee, 225; White-breasted Nuthatch, 28; Red-breasted Nuthatch, 2; Brown Creeper, 14; Winter Wren, 10; Am. Robin, 10; Golden-crowned Kinglet, 54; Cedar Waxwing, 84; Northern Shrike, 3; Starling, 735; House Sparrow, 1,815; Cardinal, 246; Evening Grosbeak, 52; Purple Finch, 28; Common Redpoll, 6; Am. Goldfinch, 175; Slate-colored Junco, 211; Tree Sparrow, 268; Field Sparrow, 8; White-throated Sparrow, 3; Swamp Sparrow, 1; Song Sparrow, 37; Snow Bunting, 95. Total, 57 species; 5115 individuals. Seen in period: Bobwhite, 16.

Dr. Frank Cook, Dr. Gordon Cummings, Morris Comfort, Eli Davis, Walter Davis, Wm. Jarman, James Leach (compiler), Howard Keast, G. Muller, Charles and Ted Maddeford, Paul Mackenzie, Peter Middleton, Miss Carolyn Hobbs, William Girling, J. C. Laughton, W. D. Sutton (McIlwraith Ornithological Club).

Melbourne, Ont. (7½-mile radius centered 1 mile north of West Lorne, Ont.; tilled land 9%, pastures 8%, river and creek gullies 40%, conifer groves 2%, lake front 20%, woodlot 21%).—26 Dec., 1958; 6.00 a.m. to 5.30 p.m.; clear; temp. -2° to 24° ; wind SW, 2-6 m.p.h.; 2 inches crusted snow. Streams frozen except at rapids. Lake Erie 9/10 covered with drift ice. 12 observers in 4 parties. Total party hours, 30 (20 on foot, 10 by car); total party miles, 124 (24 on foot, 100 by car).

Pintail, 2; Greater Scaup, 4; Common Goldeneye, 702; Common Merganser, 3; Sharp-shinned Hawk, 1; Cooper's Hawk, 2; Red-tailed Hawk, 26; Red-shouldered Hawk, 2; Bald Eagle, 1; Marsh Hawk, 12; Sparrow Hawk, 1; Bobwhite, 32; Ring-necked Pheasant, 3; Rock Dove, 71; Mourning Dove, 90; Screech Owl, 3; Great Horned Owl, 2; Short-eared Owl, 1; Yellow-shafted Flicker, 1; Pileated Woodpecker, 2; Red-bellied Woodpecker, 1; Hairy Woodpecker, 8; Downy Woodpecker, 41; Horned Lark, 31; Blue Jay, 32; Common Crow, 6; Black-capped Chickadee, 38; Tufted Titmouse, 1; White-breasted Nuthatch, 11; Red-breasted Nuthatch, 1; Brown Creeper, 8; Golden-crowned Kinglet, 12; Loggerhead Shrike, 1; Starling, 344; House Sparrow, 440; Eastern Meadowlark, 2; Cardinal, 139; Purple Finch, 8; Am. Goldfinch, 2; Slate-colored Junco, 171; Tree Sparrow, 229; White-crowned Sparrow, 3; White-throated Sparrow, 3; Swamp Sparrow, 3; Song Sparrow, 29. Total, 45 species; about 2525 individuals.

William Baker, Robert Hopper, Donald Johnson, H. L. Lancaster, Robert E. Lemon, V. Earl Lemon, Dougald Murray (compiler), Ronald Prevett, Paul Prevett, James Shostock, Fred Titus, Terry Dunford (West Elgin Nature Club).

North Bay, Ont. (Village of Ferris, Twp. of West Ferris to Nipissing Jct. and La Vase R.; settlements 80%, mixed second-growth bushland 10%, open fields 5%, lakeshore, river and marsh 5%).—30 Dec., 1958; 7.30 to 4.30 p.m.; clear, sunny; temp. -5° to 13° ; wind NNE-N-NE-NNE-NE-N-W-WSW-NW, 18-2 m.p.h.; ground covered with 12 to 18 inches of snow; lake, river and creeks frozen. 1 observer. Total party hours, 9 (6½ on foot, 2½ at feeding stations); total party miles, 9 (on foot).

Downy Woodpecker, 3; Blue Jay, 3; Black-capped Chickadee, 23; Red-breasted Nuthatch, 4; Starling, 1; Pine Grosbeak, 1; Common Redpoll, 23; Pine Siskin, 1; Am. Goldfinch, 2. Total, 9 species; 58 individuals.

Hazel V. Petty.

Ottawa, Ont. (City, suburbs, farmland, deciduous and coniferous woods).—21 Dec., 1958; 7.30 a.m. to 4.00 p.m.; temp. -16° to -3° ; wind WNW, 4-10 m.p.h.; 2 ft. snow. No open water except in rapids where "sea smoke" obscured vision. 36 observers in 12 parties. Total party hours, 63; total party miles, 359 (46 on foot, 313 by car).

Black Duck, 3; Common Goldeneye, 138; Common Merganser, 29; Goshawk, 1; Pigeon Hawk, 1; Sparrow Hawk, 1; Ruffed Grouse, 7; Ring-necked Pheasant, 19; Gray Partridge, 29; Rock Dove, 291; Yellow-shafted Flicker, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 19; Downy Woodpecker, 18; Blue Jay, 47; Common Crow, 28; Black-capped Chickadee, 148; White-breasted Nuthatch, 17; Red-breasted

Nuthatch, 2; Brown Creeper, 7; Bohemian Waxwing, 30; Cedar Waxwing, 22; Northern Shrike, 1; Starling, 2640; House Sparrow, 1187; Redwinged Blackbird, 2; Evening Grosbeak, 125; Purple Finch, 5; Pine Grosbeak, 202; Common Redpoll, 50; Am. Goldfinch, 43; Slate-colored Junco, 1; Tree Sparrow, 31; Song Sparrow, 1; Snow Bunting, 1784. Total, 35 species; 6932 individuals. Seen in census period: Snowy Owl, Am. Robin.

Dr. and Mrs. J. W. Arnold, A. W. F. Banfield, Miss A. Banning, D. R. Beckett, J. Bird, A. G. Bland, Mr. and Mrs. A. E. Bourguignon, H. M. Brown, Miss S. M. Clark, D. D. Findlay, Mr. and Mrs. D. K. Findlay, Dr. and Mrs. C. Frankton, R. E. Frith, W. E. Godfrey, Dr. and Mrs. J. W. Groves, R. H. C. Hodgson, Miss V. Humphreys, H. A. C. Jackson, H. Lloyd, E. Mills, F. Munro, E. H. Ritchie, Dr. (compiler) and Mrs. D. B. O. Savile, H. A. Savile, Dr. and Mrs. D. A. Smith, W. J. Smith, M. D. Spencer, G. L. Stevenson, J. E. Tener.

Pakenham, Ont. ($7\frac{1}{2}$ mile-radius centered on stone bridge over the Mississippi River; village streets and 2 feeding stations, open farmlands, river bank and ravines, Pakenham Hills area and Cedar Hill).—1 Jan., 1959; 8.00 a.m. to 3.30 p.m.; temp. 12° to 20° ; wind E, 15 m.p.h.; overcast all day, sleet beginning at 2.30, 9 inches snow, open water at rapids and waterfall on river. 7 observers in 5 parties. Total party hours, 20 (15 on foot, 5 by car); total party miles, 50 (20 on foot, 30 by car).

Rock Dove, 67; Hairy Woodpecker, 2; Downy Woodpecker, 3; Blue Jay, 17; Black-capped Chickadee, 35; White-breasted Nuthatch, 9; Brown Creeper, 1; Golden-crowned Kinglet, 2; Starling, 26; House Sparrow, 351; Evening Grosbeak, 116; Common Redpoll, 44; Tree Sparrow, 2; Snow Bunting, 112. Total, 14 species; 787 individuals. Seen during count period: (27 Dec.) 1 Am. Robin, 1 Ruffed Grouse, 19 Gray Partridge, 1 Pine Grosbeak; (31 Dec.) 15 Bohemian Waxwings, 6 Am. Goldfinch.

C. Fishenden, H. Fishenden, J. S. McGiffin, Verna McGiffin, R. M. McKenzie, Edna G. Ross (compiler), T. W. Ross.

Peterborough, Ont. (Open farmlands; fields 45%, marsh (swamp) 15%, water 5%, coniferous woods 5%, deciduous woods 10%, mixed woods 20%).—27 Dec., 1958; 8.30 a.m. to 4.30 p.m.; temp. 15° to 25° ; wind SW, S, 5-15 m.p.h.; fair in a.m., snowing in p.m.; 10 to 14 inches of snow on ground; lakes frozen, rivers 80% frozen. 20 observers in 6 parties. Total party hours, 42; total party miles, 380 (8 on foot, 372 by car).

Common Merganser, 1; Red-tailed Hawk, 1; Sparrow Hawk, 2; Ruffed Grouse, 10; Rock Dove, 111; Barred Owl, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 6; Downy Woodpecker, 13; Blue Jay, 117; Common Crow, 1; Black-capped Chickadee, 171; White-breasted Nuthatch, 15; Brown Creeper, 2; Northern Shrike, 3; Starling, 248; House Sparrow, 134; Evening Grosbeak, 252; Purple Finch, 4; Pine Grosbeak, 20; Common Redpoll, 49; Pine Siskin, 25; Am. Goldfinch, 107; Slate-colored Junco, 3; Tree Sparrow, 112; Song Sparrow, 2; Snow Bunting, 255. Total, 27 species; 1682 individuals.

K. Baker, S. Bond, P. Bristow, C. Cobb, R. Chandler, F. Heilingbrunner, Mrs. Fallis, J. H. Johnson, Shirley Pearse, M. Pomeroy, M. V. Powell, D. Sadler, K. W. Strasser, J. Scott, W. J. Smith, T. Smith, E. Tighe, Audrey Wilson, F. R. Pammett and J. L. McKeever (compilers).

Pickering, Ont. (40% open fields, 25% reforested land, 25% farm land, 10% marsh).—28 Dec., 1958; 7.30 a.m. to 4.00 p.m.; temp. 30° to 40° ; wind SW; about 8 inches of snow on level, 8 feet in drifts. 20 observers in 5 parties. Total party hours, $36\frac{1}{2}$ (15 on foot, $21\frac{1}{2}$ by car); total party miles, 333 (63 on foot, 270 by car).

Mallard, 2; Black Duck, 85; Common Goldeneye, 101; Oldsquaw, 337; Common Merganser, 18; Red-breasted Merganser, 3; Cooper's Hawk, 1; Sparrow Hawk, 9; Ruffed Grouse, 11; Ring-necked Pheasant, 9; Glaucous Gull, 1; Great Black-backed Gull, 10; Herring Gull, 382; Ring-billed Gull, 5; Rock Dove, 132; Long-eared Owl, 10; Short-eared Owl, 2; Belted Kingfisher, 1; Pileated Woodpecker, 3; Hairy Woodpecker, 9; Downy Woodpecker, 20; Blue Jay, 89; Common Crow, 6; Black-capped Chickadee, 639; White-breasted Nuthatch, 12; Red-breasted Nuthatch, 2; Brown Creeper, 3; Winter Wren, 1; Am. Robin, 13; Golden-crowned Kinglet, 11; Cedar

Waxwing, 1; Northern Shrike, 6; Starling, 314; House Sparrow, 283; Cardinal, 24; Evening Grosbeak, 62; Purple Finch, 6; Am. Goldfinch, 336; Rufous-sided Towhee, 1; Slate-colored Junco, 149; Tree Sparrow, 302; Swamp Sparrow, 2; Song Sparrow, 6; Snow Bunting, 1955. Total, 44 species; 5374 individuals.

M. Armstrong, A. Bunker (compiler), Miss A. Carruthers, G. Cole, F. Dilling, Miss B. Henry, Miss M. Henry, F. Ireson, Mr. and Mrs. W. Laird, R. Laird, R. Lawrence, Mrs. W. McRae, W. Neal, G. Owen, G. Scott, Mrs. F. Stephens, J. Theberge, T. Tozer, R. Tozer (Oshawa Naturalists Club).

Pickering Township, Ont. (15 acres mixed woodland: white cedar 20%, hemlock 20%, poplar, birch, ironwood, maple 45%, uncultivated fields 15%; three miles of country roads: fields 50%, mixed woodlands 50%; two active feeding stations).—27 Dec., 1958; 7.20 a.m. to 4.50 p.m.; partly cloudy to overcast with snow; temp. 12° to 33°; wind SW, 0-5 m.p.h.; ground covered with 2 to 6 inches of old snow with about an additional inch of wet snow accumulating during the afternoon; creek and ponds frozen. 2 observers in 2 parties. Total party hours, 17 (14 on foot, 3 by car); total party miles, 7, (4 on foot, 3 by car).

Hairy Woodpecker, 1; Downy Woodpecker, 8; Blue Jay, 20; Black-capped Chickadee, 23; White-breasted Nuthatch, 1; Am. Robin, 2; Starling, 15; House Sparrow, 57; Cardinal, 5; Evening Grosbeak, 2; Purple Finch, 5; Pine Siskin, 28; Am. Goldfinch, 107; Slate-colored Junco, 19; Oregon Junco, 1; Tree Sparrow, 27. Total, 16 species; 321 individuals. Also seen in area in count period: Sharp-shinned Hawk, Red-tailed Hawk, Ruffed Grouse, Ring-necked Pheasant, Boreal Owl, Hermit Thrush, Cedar Waxwing, Evening Grosbeak.

Doris Huestis Speirs, John Murray Speirs (compiler).

Port Arthur and Fort William, Ont. (15-mile radius about Canadian Lakehead; 10% lake, mainly frozen; 6% pear and muck bogs, 12% industrial and residential areas, 25% farmlands, 47% woodlands).—26 Dec., 1958; 8 a.m. to 5 p.m.; dull to bright; temp. 8° to 29°; wind WSW to ENE, 6-0 m.p.h.; 14 inches snow on ground. 19 observers in 10 parties. Total party hours, 35 (13 on foot, 22 by car); total party miles, 328 (22 on foot, 306 by car).

Common Goldeneye, 5; Ruffed Grouse, 7; Gray Partridge, 10; Glaucous Gull, 4; Herring Gull, 862; Ring-billed Gull, 2; Rock Dove, 775; Pileated Woodpecker, 2; Hairy Woodpecker, 11; Downy Woodpecker, 28; Gray Jay, 7; Blue Jay, 27; Common Raven, 181; Common Crow, 12; Black-capped Chickadee, 71; Boreal Chickadee, 3; Am. Robin, 37; Bohemian Waxwing, 457; Cedar Waxwing, 15; Northern Shrike, 1; Starling, 971; House Sparrow, 1810; Common Grackle, 1; Evening Grosbeak, 10; Pine Grosbeak, 173; Common Redpoll, 23. Total, 26 species; 5505 individuals.

Dr. and Mrs. A. E. Allin, Mrs. R. M. Beckett, Miss Rita Bourne, Keith Denis (compiler), N. Denis, R. Denis, Captain and Mrs. A. E. Fader, C. E. Garton, Mrs. M. Knowles, D. B. McKillop, R. Robb, S. Robb, Mr. and Mrs. C. Rydholm, L. Rydholm, Miss Marion Smith, J. Thompson (Thunder Bay Field Naturalists' Club).

Richmond Hill, Ont. (Suburban and farm land, small swamps, small wooded areas, very little water).—27 Dec., 1958; 8.30 a.m. to 2.30 p.m.; temp. 10° to 20°; wind NW, 10 m.p.h.; sunny, perfect winter day, puddles frozen, average depth of snow 8 to 12 inches in woods. 19 full-time, 8 part-time observers in 4 parties. Total party miles, 140 (22 on foot, 118 by car).

Sharp-shinned Hawk, 1; Red-tailed Hawk, 1; Sparrow Hawk, 4; Ring-necked Pheasant, 20; Herring Gull, 2; Rock Dove, (not counted); Mourning Dove, 1; Belted Kingfisher, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 2; Downy Woodpecker, 19; Black-backed Three-toed Woodpecker, 1; Blue Jay, 48; Black-capped Chickadee, 129; White-breasted Nuthatch, 13; Red-breasted Nuthatch, 27; Brown Creeper, 1; Am. Robin, 6; Golden-crowned Kinglet, 5; Cedar Waxwing, 22; Starling, 27; House Sparrow, (not counted—numerous); Cardinal, 23; Evening Grosbeak, 10; Purple Finch, 2; Pine Siskin, 107; Am. Goldfinch, 195; Savannah Sparrow, 1; Slate-

colored Junco, 16; Oregon Junco, 1; Tree Sparrow, 103; White-throated Sparrow, 1; Song Sparrow, 3; Snow Bunting, 15. Total, 34 species, 815 individuals.

P. Addison, Mrs. Peter Addison (compiler), C. Bancroft, Mr. and Mrs. C. Bishop, R. Campbell, D. Gibson, W. Hargraves, Mr. and Mrs. S. Harwood, Mr. and Mrs. D. Hughes, L. Hughes, W. J. Large, J. Lunn, T. McVean, D. Pimlott, Mr. and Mrs. S. Porter, J. Seddon, J. Sherbarth, R. Stanfield, Mr. and Mrs. S. Strand, C. Tuck (Richmond Hill Naturalists Club).

Terra Cotta, Ont. (Feeding station and Terra Cotta village and nearby country).—21 Dec., 1958; 8 a.m. to sundown; temp. 0°; no wind, bright sun. Total party miles, 6.

Red-tailed Hawk, 1; Yellow-shafted Flicker, 1; Hairy Woodpecker, 2; Downy Woodpecker, 2; Blue Jay, 20; Black-capped Chickadee, 18; White-breasted Nuthatch, 1; Brown Creeper, 1; Evening Grosbeak, 1; Am. Goldfinch, 9; Slate-colored Junco, 6; Tree Sparrow, 15. Total, 12 species; 77 individuals. Seen in count period: Snow Bunting, 50.

Mrs. L. E. Jaquith (compiler), Mr. L. E. Jaquith.

Toronto, Ont. (Routes many years established in the circle bounded by Clarkson, Schomberg and Whitby).—28 Dec., 1958; 7:30 a.m. to 6 p.m.; temp. 30° to 35°; wind none; cloudy early, clearing later; ground thinly snow-covered; creeks and ponds frozen. 126 observers in 28 parties.

Horned Grebe, 5; Great Blue Heron, 1; Mallard, 993; Black Duck, 985; Am. Widgeon, 2; Redhead, 1; Canvasback, 1; Greater Scaup, 8184; Lesser Scaup, 1; Common Goldeneye, 513; Bufflehead, 79; Oldsquaw, 2293; Harlequin Duck, 1; Common Merganser, 84; Red-breasted Merganser, 5; Goshawk, 2; Sharp-shinned Hawk, 3; Cooper's Hawk, 4; Red-tailed Hawk, 39; Red-shouldered Hawk, 5; Rough-legged Hawk, 7; Bald Eagle, 1; Marsh Hawk, 2; Pigeon Hawk, 1; Sparrow Hawk, 71; Ruffed Grouse, 11; Ring-necked Pheasant, 267; Glaucous Gull, 3; Great Black-backed Gull, 56; Herring Gull, 2632; Ring-billed Gull, 549; Mourning Dove, 22; Screech Owl, 3; Great Horned Owl, 5; Snowy Owl, 1; Long-eared Owl, 31; Short-eared Owl, 1; Saw-whet Owl, 4; Belted Kingfisher, 4; Yellow-shafted Flicker, 2; Pileated Woodpecker, 8; Hairy Woodpecker, 128; Downy Woodpecker, 288; Black-backed Three-toed Woodpecker, 2; Blue Jay, 300; Common Crow, 113; Black-capped Chickadee, 917; White-breasted Nuthatch, 169; Red-breasted Nuthatch, 17; Brown Creeper, 96; Winter Wren, 1; Carolina Wren, 1; Brown Thrasher, 1; Am. Robin, 23; Hermit Thrush, 1; Golden-crowned Kinglet, 90; Ruby-crowned Kinglet, 3; Cedar Waxwing, 55; Northern Shrike, 14; Starling, 3557; House Sparrow, 2082; Redwinged Blackbird, 1; Rusty Blackbird, 14; Brown-headed Cowbird, 5; Cardinal, 120; Evening Grosbeak, 22; Purple Finch, 47; Common Redpoll, 17; Pine Siskin, 155; Am. Goldfinch, 1302; Rufous-sided Towhee, 1; Slate-colored Junco, 365; Oregon Junco, 3; Tree Sparrow, 903; Field Sparrow, 4; White-throated Sparrow, 6; Swamp Sparrow, 4; Song Sparrow, 133; Snow Bunting, 399. Total, 79 species; 28,242 individuals.

J. Baillie (compiler), H. Barnett, M. Bartman, F. Beckley, G. Bennett, O. Bennett, Ralph Brown, Ruth Brown, D. Bunker, E. Bunker, F. Bunston, D. E. Burton, L. Butcher, P. Carey, J. Cartwright, D. Clarke, E. Clarke, L. Clarke, S. Clarke, F. Crawford, A. Cocker, V. Crich, C. Crowley, J. Crowley, A. Dawe, G. Dawe, M. Devitt, O. Devitt, D. Elder, F. Emery, G. Fairfield, J. Fairfield, B. Falls, T. Farley, R. Foster, D. Fowle, G. Francis, P. Freeman, A. Gatti, R. Gaymer, B. Geale, D. Geale, J. Geale, Clive Goodwin, Chis. Goodwin, A. Gordon, G. Guthrie, H. Halliday, R. Hansell, N. Hawkrigg, F. Helleiner, D. Russell, R. James, M. Jarrett, J. Keenleyside, G. Lambert, L. Langstaff, H. Lawrence, B. LeVay, F. LeVay, J. LeVay, N. LeVay, J. Livingston, F. Lovesy, M. Lovesy, J. Lunn, J. Mackintosh, A. Mason, B. Mackay, D. Mackay, P. Mackay, K. Mayall, R. McCleary, R. McClelland, M. McKay, A. Mitchener, C. Molony, G. Myland, K. Nelson, P. Nelson, J. Norris, D. O'Brien, D. Pace, G. Page, M. Pannell, R. Pannell, E. Park, J. Parker, R. Pepall, D. Perks, F. Pombiere, W. Renison, H. Richards, R. A. Ritchie, R. C. Ritchie, R. Saunders, J. Shorin, T. Shortt, L. Simmons, Doug. Smith, J. Smith, R. Smith, W. Smith, E. Stark, N. Stewart, B. Stupart, L. Szijj, R. Tasker, A. Telfer, W. Tovell, R. Trowern, V. Trowern, N. Verbeek, J. Walty, E. Wasserfall, W. Wasserfall, E. West, J. D. West, M. West, D. Willcocks, W. Williams, Roy Wilson, J. Woodford, P. Woodford, J. Woods, R. Woods.

Westport, Ont. (Farmland 15%, lakes 20%, marshes 5%, deciduous woodland 40%, mixed woodland 18%, red cedar groves 2%).—21 Dec., 1958; 7:30 a.m. to 4:30 p.m.; clear; temp. -2° to 10°; wind NW, 5 m.p.h.; 12 inches snow on ground, lakes frozen. 11

observers in 4 parties. Total party hours, $24\frac{1}{2}$ (14 on foot, $10\frac{1}{2}$ by car); total party miles, $152\frac{1}{2}$ ($16\frac{1}{2}$ on foot, 136 by car).

Mallard, 1; Wood Duck, 1; Common Goldeneye, 1; Sharp-shinned Hawk, 1; Ruffed Grouse, 2; Great Horned Owl, 1; Yellow-shafted Flicker, 1; Pileated Woodpecker, 2; Hairy Woodpecker, 1; Downy Woodpecker, 5; Gray Jay, 1; Blue Jay, 23; Common Crow, 1; Black-capped Chickadee, 171; White-breasted Nuthatch, 7; Red-breasted Nuthatch, 1; Brown Creeper, 2; Starling, 37; House Sparrow, 45; Evening Grosbeak, 1; Purple Finch, 26; Pine Grosbeak, 1; Am. Goldfinch, 13; Slate-colored Junco, 9; Tree Sparrow, 97; Song Sparrow, 2; Snow Bunting, 104. Total, 27 species; 557 individuals.

F. Arnold, R. Arnold, D. Cliff, L. Cliff, D. Crawford, M. Edwards, M. L'Estrange, J. McIntyre, M. McIntyre, A. Strong (compiler), D. Webb.

SASKATCHEWAN

Saskatoon, Sask. (A circle 15 miles in diameter, centered 2 miles south of Saskatoon, including the city, the wooded banks of the Saskatchewan River, three golf courses, the Forestry Farm and surrounding fields and pastures).—26 Dec., 1958; 8.00 a.m. to 4.00 p.m.; temp. 21° to 24° ; wind light; overcast; very light snow in the afternoon; ground covered with 5 inches of snow. 29 observers in 7 parties. Total party hours, 37 (14 on foot, 23 by car); total party miles, 223 (23 on foot, 200 by car).

Mallard, 9; Common Goldeneye, 2; Pigeon Hawk, 1; Ruffed Grouse, 2; Sharp-tailed Grouse, 46; Ring-necked Pheasant, 17; Gray Partridge, 29; Ring-billed Gull, 1; Great Horned Owl, 2; Hairy Woodpecker, 2; Downy Woodpecker, 4; Blue Jay, 8; Black-billed Magpie, 123; Black-capped Chickadee, 57; Bohemian Waxwing, 296; Starling, 30; House Sparrow, 2765; Evening Grosbeak, 14; Pine Grosbeak, 55; Common Redpoll, 440; Slate-colored Junco, 1; Oregon Junco, 2; Snow Bunting, 15. Total, 23 species; 3921 individuals. Seen in census period: American Robin, 1; Brewer's Blackbird.

Robert Folker, Bernard Gollop, Mr. and Mrs. Jim Hogg, John Shadick, Pern Cordrey, Victor Harper, Ted Wedge, Wendy Wedge, Lindy Wedge, Dr. and Mrs. Ronald Bremner, Dr. and Mrs. C. J. L'Ami, Mrs. Laura Rowles, Peggy O'Neil, Dr. and Mrs. John Gerrard, Jonathan Gerrard, Gwynneth Rowe, Dr. F. E. Waite, Ralph Palmer, Bob Pravda, Ralph Morris, David Morris, George Gerrity, Ross Gerrity, Bob Mills, J. Frank Roy (compiler) (Members and friends of the Saskatoon Natural History Society).

Yorkton, Sask. (Mixed farming country 75%, woodland 25%).—26 Dec., 1958; 8 a.m. to 4.30 p.m.; overcast; temp. 19° to 21° ; wind SE, 6 m.p.h.; ground covered with 12 inches of snow. 20 observers in 7 parties. Total party hours, $27\frac{1}{2}$ ($13\frac{1}{2}$ on foot, 14 by car); total party miles, $108\frac{1}{2}$ ($21\frac{1}{2}$ on foot, 87 by car).

Goshawk, 1; Pigeon Hawk, 1; Ruffed Grouse, 6; Sharp-tailed Grouse, 82; Gray Partridge, 43; Great Horned Owl, 1; Hairy Woodpecker, 1; Downy Woodpecker, 2; Blue Jay, 1; Black-billed Magpie, 54; Black-capped Chickadee, 22; Bohemian Waxwing, 19; House Sparrow, 965; Evening Grosbeak, 4; Pine Grosbeak, 8; Common Redpoll, 268; Snow Bunting, 576. Total, 17 species; 2054 individuals.

Gary Anweiler, Brother Eugene, Brother Joseph, Henry Chilman, Jr., Ronald Coleman, Terry Coleman, Tom Cursons, Archie Fraser, Art Gellert, Bill Horseman, Dr. Stuart Houston (compiler), Roxby Hughes, Bob Pearce, Irving Pearce, Elwood Sharpe, Cliff Shaw, Jeff Smith, Don Swaby, Frank Switzer, Guilain Switzer (Yorkton Natural History Society).

ALBERTA

Calgary, Alta. ($7\frac{1}{2}$ -mile radius centering on Louise Bridge and Bow River, including Inglewood Bird Sanctuary, Bowness Park, Spruce Cliff, Ogden, Glenmore Reservoir, Bow and Elbow Rivers, prairie farmland within area).—21 Dec., 1958; 8 a.m. to 5 p.m.; mostly sunny and mild; temp. 33° to 49° ; wind W, 10 m.p.h.; ground bare, with 2 inches of old snow in sheltered areas, rivers open, reservoir and prairie sloughs frozen. 9 observers in 3 parties. Total party hours, $24\frac{1}{2}$ (13 on foot, $11\frac{1}{2}$ by car); total party miles, 143 (8 on foot, 135 by car).

Mallard, 878; Common Goldeneye, 237; Common Merganser, 77; Accipiter, large (Sp?) 1; Pigeon Hawk, 2; Ring-necked Pheasant, 45; Gray Partridge, 46; Snowy

Owl, 2; Owl, large (Sp?) 1; Belted Kingfisher, 1; Hairy Woodpecker, 2; Downy Woodpecker, 3; Horned Lark, 1; Black-billed Magpie, 230; Black-capped Chickadee, 127; Boreal Chickadee, 3; Red-breasted Nuthatch, 4; Brown Creeper, 3; Golden-crowned Kinglet, 8; Bohemian Waxwing, 32; Starling, 4; House Sparrow, 563; Pine Grosbeak, 4; Common Redpoll, 204; White-winged Crossbill, 15; Oregon Junco, 3; Tree Sparrow, 3. Total, 27 species; about 2499 individuals. Seen in area during count period: Bald Eagle, Prairie Falcon.

E. D. Beacham (compiler), Frank Bell, T. Berlando, John Clarke, Ian Halladay, Cedric Hitchon, W. E. McKay, Vera Morrison, Alfred Schulze (Calgary Bird Club).

Edmonton, Alta. (7½-mile radius centered on Edmonton Airport; river valley, wooded ravines, mixed farm land, city parks, some muskeg).—21 Dec., 1958; 8.30 a.m. to 4.30 p.m.; temp. 10° to 35°; wind W, 4 m.p.h.; overcast, light rain and snow 11.30 a.m. to 3 p.m. 21 observers in 7 parties. Total party hours, 30½ (21½ on foot, 9 by car); total party miles, 113½ (24½ on foot, 89 by car).

Mallard, 71; Golden Eagle, 1; Pigeon Hawk, 3; Ruffed Grouse, 3; Ring-necked Pheasant, 33; Gray Partridge, 21; Rock Dove, 27; Great Horned Owl, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Downy Woodpecker, 31; Gray Jay, 6; Blue Jay, 23; Black-billed Magpie, 86; Common Crow, 1; Black-capped Chickadee, 138; Boreal Chickadee, 21; Red-breasted Nuthatch, 1; Brown Creeper, 2; Bohemian Waxwing, 1855; Starling, 30; House Sparrow, 241; Evening Grosbeak, 31; Pine Grosbeak, 22; Common Redpoll, 44; White-winged Crossbill, 52; Snow Bunting, 16. Total, 27 species; 2762 individuals. Also seen during count period: Sharp-shinned Hawk, Snowy Owl, White-breasted Nuthatch, Northern Shrike.

A. Allan, G. Ball, K. Ball, D. Bassett, A. Blades, M. Boyd, H. Campbell, M. Forge, H. Habgood, C. Hampson, M. Hampson, R. Heath, E. Hohn, E. Jones, R. Lister, A. MacGregor, H. Pegg (compiler), B. Steele, P. Thompson, R. Turner, M. Wallbridge,

Glenevis, Alta. (Around farmyard and through mixed spruce-poplar woods, along country roadsides).—21 Dec., 1958; 7 a.m. to 5 p.m.; temp. 9° to 35°; wind SW, 5-10 m.p.h.; overcast, light rain, 10 inches of snow on ground. 1 observer. Total party hours, 9 (6 on foot, 3 by car); total party miles, 36 (10 on foot, 26 by car).

Ruffed Grouse, 5; Sharp-tailed Grouse, 1; Great Horned Owl, 2; Pileated Woodpecker, 2; Hairy Woodpecker, 6; Downy Woodpecker, 5; Black-backed Three-toed Woodpecker, 1; Gray Jay, 5; Blue Jay, 5; Black-billed Magpie, 9; Black-capped Chickadee, 14; Boreal Chickadee, 9; Evening Grosbeak, 4; Pine Grosbeak, 10; Common Redpoll, 10; White-winged Crossbill, 1; Fox Sparrow, 1; Snow Bunting, 25. Total, 18 species; 115 individuals. Seen also in count period: Goshawk, 1; Northern Shrike, 1; House Sparrow, 1.

George Pegg.

BRITISH COLUMBIA

Crescent Beach, B.C. (Shoreline Ocean Park, White Rock Pier, Manten's Nursery, Crescent Beach, Shoreline Crescent Beach, arable land between Port Kells and Fry's Corner, Surrey Municipality, North Bluff Road, Surrey).—30 Dec., 1958; 8 a.m. to 4 p.m.; temp. 45° to 50°; wind not perceptible. Intermittent drizzle, some fog, visibility poor. 8 observers in 2 parties. One at feeding station. Total party hours, 12 (11 on foot and bicycle, 1 by car); total party miles, 16 (10 on foot and bicycle, 12 by car).

Common Loon, 8; Arctic Loon, 1; Red-necked Grebe, 3; Horned Grebe, 8; Western Grebe, 2; Brandt's Cormorant, 3; Pelagic Cormorant, 2; Great Blue Heron, 3; Mallard, 1; Pintail, 3; Canvasback, 4; Greater Scaup, 27; Common Goldeneye, 6; Bufflehead, 18; Oldsquaw, 8; Harlequin Duck, 2; White-winged Scoter, 8; Surf Scoter, 28; Common Scoter, 1; Ruddy Duck, 1; Hooded Merganser, 1; Red-breasted Merganser, 5; Red-tailed Hawk, 1; Marsh Hawk, 1; Ring-necked Pheasant, 4; Black Turnstone, 10; Glaucous-winged Gull, 7; Mew Gull, 6; Marbled Murrelet, 2;

Rock Dove, 16; Belted Kingfisher, 1; Red-shafted Flicker, 1; Hairy Woodpecker, 1; Downy Woodpecker, 2; Steller's Jay, 3; Northwestern Crow, 23; Black-capped Chickadee, 38; Chestnut-backed Chickadee, 4; Winter Wren, 5; Bewick's Wren, 4; Am. Robin, 6; Varied Thrush, 13; Golden-crowned Kinglet, 11; Northern Shrike, 1; House Sparrow, 28; Brewer's Blackbird, 50; Evening Grosbeak, 1; Purple Finch, 9; Common Redpoll, 3; Rufous-sided Towhee, 24; Oregon Junco, 82; Fox Sparrow, 9; Song Sparrow, 27. Total, 53 species; 546 individuals.

H. N. Clarke, Canon M. W. Holdom (compiler), Mrs. W. Munro, Peter St. John, Sir John Simeon, Bt., Richard Simeon, Tom Stevens, E. E. Woodford.

Ladner, B.C. ($7\frac{1}{2}$ -mile radius circle centered at intersection on Goudy Rd., $1\frac{1}{2}$ mile S. of Ladner Trunk Rd., including peninsula of Pt. Roberts, Municipality of Delta, shores of Boundary Bay and Georgia Strait, Salt water 40%, dyked farmland 20%, peat bog 15%, marshes and shores 15%, upland conifer 5%, suburban 5%).—21 Dec., 1958; 7.40 a.m. to 4.40 p.m.; mostly overcast, showers; temp. 46° to 48° ; wind SE-S-SW, 15-25-10 m.p.h.; ground bare and unfrozen, all waters open. 5 observers in 4 parties. Total party hours, 31 ($25\frac{1}{2}$ on foot, 3 by bicycle, $2\frac{1}{4}$ by car); total party miles, 87 (39 on foot, 26 by car, 2 by bicycle).

Loon (sp?), 289; Common Loon, 50; Arctic Loon, 17; Red-throated Loon, 28; Red-necked Grebe, 31; Horned Grebe, 51; Eared Grebe, 4; Western Grebe, 204; Cormorant (sp?), 15; Double-crested Cormorant, 20; Brandt's Cormorant, 3; Pelagic Cormorant, 4; Great Blue Heron, 70; Snow Goose, 13; Mallard, 203; Pintail, 8150+; Am. Widgeon, 8331; Greater Scaup, 126; Common Goldeneye, 70; Barrow's Goldeneye, 82; Bufflehead, 195; Oldsquaw, 484; Harlequin Duck, 15; White-winged Scoter, 176; Surf Scoter, 355; Common Scoter, 93; Common Merganser, 2; Red-breasted Merganser, 214; Sharp-shinned Hawk, 1; Cooper's Hawk, 2; Red-tailed Hawk, 3; Rough-legged Hawk, 2; Bald Eagle, 4; Marsh Hawk, 2; Pigeon Hawk, 1; Peregrine Falcon, 1; Sparrow Hawk, 3; Ruffed Grouse, 3; California Quail, 17; Ring-necked Pheasant, 204; Am. Coot, 6; Killdeer, 98; Black Turnstone, 59; Common Snipe, 1; Greater Yellowlegs, 2; Dunlin, 12350+; Sanderling, 101; Glaucous-winged Gull, 1818; Herring Gull, 38; Mew Gull, 1315; Bonaparte's Gull, 2; Common Murre, 100; Marbled Murrelet, 22; Pigeon Guillemot, 36; Short-eared Owl, 2; Saw-whet Owl, 1; Belted Kingfisher, 2; Red-shafted Flicker, 72; Pileated Woodpecker, 2; Downy Woodpecker, 8; Steller's Jay, 6; Northwestern Crow, 292; Black-capped Chickadee, 85; Chestnut-backed Chickadee, 5; Common Bushtit, 11; Red-breasted Nuthatch, 7; Brown Creeper, 5; Winter Wren, 14; Bewick's Wren, 19; Am. Robin, 151; Varied Thrush, 36; Golden-crowned Kinglet, 99+; Ruby-crowned Kinglet, 7; Northern Shrike, 3; Starling, 6; House Sparrow, 419; Western Meadowlark, 98; Redwinged Blackbird, 273; Brewer's Blackbird, 1361+; Evening Grosbeak, 70; Purple Finch, 16; House Finch, 301; Common Redpoll, 21; Pine Siskin, 259+; Savannah Sparrow, 1; Rufous-sided Towhee, 75; Slate-colored Junco, 2; Oregon Junco, 573; White-crowned Sparrow, 5; Fox Sparrow, 11; Song Sparrow, 330; Snow Bunting, 10. Total, 90 species; more than 39,840 individuals, also 304 identified as to genus but not to species (Loons sp? probably mostly Common—seen in flight against driving rain).

Rudolf Drent, A. J. Erskine (compiler), Mr. and Mrs. Werner Hesse, W. M. Hughes.

100 Mile House, B.C. (Vicinity of Town of 100 Mile House, and along Cariboo Highway south to Clinton. Elevation 3000 to 3500 feet. Topography rolling, forested with lodgepole pine, fir and poplar and broken by frequent swamps, lakes and meadows).—27 Dec., 1958; 10.00 a.m. to 4.30 p.m.; temp. 6° to 32° ; wind SE, 0-5 m.p.h.; 3-4 inches snow. All lakes and streams frozen over. Temperature above normal. 1 observer. Total party hours, $5\frac{1}{2}$ ($1\frac{1}{2}$ on foot, 4 by car); total party miles, 64 (2 on foot, 62 by car).

Ruffed Grouse, 1; Gray Jay, 1; Common Raven, 1; Common Crow, 8; Black-capped Chickadee, 11; Brown Creeper, 1; Starling, 2; House Sparrow, 14. Total, 8

species; 39 individuals. Seen in period: Goshawk, Great Gray Owl, Horned Owl, Spruce Grouse, Pileated Woodpecker.

H. B. Hammer (compiler).

Penticton, B.C. (Penticton lowlands to Summerland northern limits, 12 miles lake-front, adjoining orchards and wooded hills; Penticton south through Kaleden to Vaseaux Lake).—26 Dec., 1958; 9.30 a.m. to 4.00 p.m.; temp. 36° to 40°; wind S, 25 m.p.h.; overcast, showers in early morning and late afternoon, snow (up to 5 inches) on higher levels. 10 observers in 3 parties. Total party hours, 12 (9 on foot, 3 by car); total party miles, 74 (16 on foot, 58 by car).

Horned Grebe, 3; Eared Grebe, 1; Western Grebe, 15; Mallard, 20; Am. Widgeon, 20; Redhead, 300+; Canvasback, 6; Lesser Scaup, 20; Common Goldeneye, 18; Bufflehead, 14; Hooded Merganser, 2; Common Merganser, 1; Red-breasted Merganser, 2; Golden Eagle, 1; California Quail, 77; Ring-necked Pheasant, 11; Am. Coot, 6,600+; Killdeer, 1; Herring Gull, 29; Red-shafted Flicker, 16; Lewis Woodpecker, 3; Hairy Woodpecker, 1; Downy Woodpecker, 1; Steller's Jay, 1; Black-billed Magpie, 34; Common Raven, 5; Clark's Nutcracker, 5; Black-capped Chickadee, 8; Mountain Chickadee, 3; White-breasted Nuthatch, 3; Red-breasted Nuthatch, 8; Pygmy Nuthatch, 15; Am. Dipper, 3; Townsend's Solitaire, 1; Golden-crowned Kinglet, 1; Northern Shrike, 2; House Sparrow, 50+; House Finch, 3; Rosy Finch, 250+; Oregon Junco, 95+; Song Sparrow, 13. Total, 41 species; 7,662 individuals. Observed in count period: Canada Goose, 4; Green-winged Teal, 3; Sparrow Hawk, 2; Gray Partridge, 18; Mourning Dove, 2; Pileated Woodpecker, 1; Winter Wren, 1; Long-billed Marsh Wren, 1; Am. Robin, 1; Bohemian Waxwing, 200+; Redwinged Blackbird, 6; Pine Grosbeak, 8; Common Redpoll, 18; Pine Siskin, 20; American Goldfinch, 3; Snow Bunting, 1.

Jean Cannings, Robert Cannings, Stephen Cannings (compiler), David Holman, John Holman, Muriel Holman, Philip Holman, John McDougald, Donald Tait, Eric Tait.

Vancouver, B.C. (7½-mile radius centering on Broadway West and Granville Street; including the City of Vancouver, North Vancouver, parts of the municipalities of Burnaby, West Vancouver and Richmond, part of Burrard Inlet and North Arm of the Fraser River; salt water 30%, shores 3%, marsh 3%, open fields 9%, built-up areas 41%, city parks 7%, coniferous forests 7%).—26 December, 1958; 7.45 a.m. to 4.30 p.m.; temp. 42° to 48°; wind SE, light, 15 m.p.h.; overcast with intermittent rain. 49 observers in 20 parties. Total party hours, 150 (2½ by canoe, 4 by bicycle, 126½ on foot and 17 by car); total party miles, 390 (6 by canoe, 18½ by bicycle, 211 on foot, 154½ by car).

Common Loon, 35; Arctic Loon, 4; Red-throated Loon, 5; Loon (sp.?), 3; Red-necked Grebe, 6; Horned Grebe, 70; Eared Grebe, 19; Western Grebe, 1,532; Pied-billed Grebe, 1; Double-crested Cormorant, 83; Plagic Cormorant, 56; Cormorant (sp.?), 29; Great Blue Heron, 50; Canada Goose, 8; Lesser Snow Goose, 22; Mallard, 2,155; Am. Widgeon, 1,338; Pintail, 1,161; Green-winged Teal, 108; Shoveller, 7; Wood Duck, 8; Canvasback, 4; Greater Scaup, 2,648; Lesser Scaup, 2; Common Goldeneye, 419; Barrow's Goldeneye, 899; Bufflehead, 292; Oldsquaw, 101; Harlequin Duck, 25; White-winged Scoter, 367; Surf Scoter, 2,705; Common Scoter, 543; Ruddy Duck, 4; Hooded Merganser, 16; Common Merganser, 117; Red-breasted Merganser, 407; Sharp-shinned Hawk, 1; Cooper's Hawk, 2; Red-tailed Hawk, 9; Rough-legged Hawk, 3; Bald Eagle, 5; Marsh Hawk, 4; Peregrine Falcon, 2; Pigeon Hawk, 7; Sparrow Hawk, 8; Ruffed Grouse, 4; Ring-necked Pheasant, 120; Am. Coot, 321; Killdeer, 23; Black Turnstone, 88; Common Snipe, 15; Dunlin, 4,372; Sanderling, 311; Glaucous-winged Gull, 27,547; Herring Gull, 811; California Gull, 1; Mew Gull, 9,539; Bonaparte's Gull, 117; Common Murre, 270; Pigeon Guillemot, 41; Marbled Murrelet, 77; Ancient Murrelet, 1; Barn Owl, 2; Short-eared Owl, 7; Belted Kingfisher, 7; Yellow-shafted Flicker, 1; Red-shafted Flicker, 81; Pileated Woodpecker, 3; Yellow-

bellied Sapsucker, 6; Hairy Woodpecker, 3; Downy Woodpecker, 18; Horned Lark, 16; Steller's Jay, 79; Common Raven, 10; Northwestern Crow, 638; Black-capped Chickadee, 178; Chestnut-backed Chickadee, 23; Red-breasted Nuthatch, 7; Brown Creeper, 6; Winter Wren, 52; Bewick's Wren, 14; Long-billed Marsh Wren, 1; Am. Robin, 1,558; Varied Thrush, 85; Golden-crowned Kinglet, 120; Ruby-crowned Kinglet, 20; Cedar Waxwing, 737; Northern Shrike, 5; Starling, 30,683; Crested Mynah, 152; House Sparrow, 1,270; Western Meadowlark, 37; Redwinged Blackbird, 440; Brewer's Blackbird, 4,796; Evening Grosbeak, 112; Purple Finch, 59; House Finch, 519; Pine Siskin, 413; Rufus-sided Towhee, 114; Slate-colored Junco, 3; Oregon Junco, 804; White-crowned Sparrow, 34; Golden-crowned Sparrow, 5; Fox Sparrow, 15; Song Sparrow, 610; Snow Bunting, 7. Total, 104 species; 102,698 individuals.

Bill Adams, R. Anderson, Dorothy Bain, Jack Bain, Miss Mary Barkworth, Mrs. R. C. Barkworth, Dorothy Bradley, Stewart Bradley, Sheila Buchanan, Mr. and Mrs. Copping, R. Copping, E. Church, R. Drent, A. J. Erskine, C. Gough, J. Hobson, William M. Hughes (compiler), Mrs. J. D. Kidd and son, Hugh MacDonald, Mrs. MacFeat, George M. McKay, J. Ross Mackay, Violet Mackay, L. Marsh, W. J. Merilees, W. L. Merilees, Ed Moodie, Allister Muir, Verna Newson, N. Precious, Dr. and Mrs. J. D. Randall and family, M. J. Rombough, Rosamund Ross, F. Sandford, J. G. Sarles, H. C. Sieburth, Mary Sieburth, Elizabeth Smith, E. Smith, G. B. W. Stevens, Gerald Stevens, Miss Tanis Stevens, R. Tripp, K. Vermeer, R. Webber, Miss B. Wise, Gwen Wright.

Vernon, B.C. (North to Buckersfield's Ranch, west to Okanagan Landing, south to Rattlesnake Point, Kalamalka Lake and east to Coldstream Ranch).—28 Dec., 1958; 8 a.m. to 4 p.m.; cloudy to overcast; temp. 30° to 36°; wind S, calm to 10 m.p.h.; Okanagan and Kalamalka lakes clear of ice, Swan Lake frozen over. No snow on some southern slopes; 8 inches in sheltered woods. 19 observers in 4 parties. Total party hours, 28 (16 on foot, 12 by car); total party miles, 110 (24 on foot, 86 by car).

Red-necked Grebe, 6; Horned Grebe, 24; Eared Grebe, 3 (J.G., B.A.S.); Western Grebe, 23; Pied-billed Grebe, 2; Great Blue Heron, 5; Mallard, 452; Pintail, 3; Green-winged Teal, 2; Am. Widgeon, 94; Redhead, 176; Ring-necked Duck, 10; Canvasback, 9; Greater Scaup, 58; Lesser Scaup, 14; Common Goldeneye, 5; Barrow's Goldeneye, 2; Goldeneye (sp.?), 15; Bufflehead, 3; Common Merganser, 5; Goshawk, 1; Sharp-shinned Hawk, 1; Pigeon Hawk, 1; Sparrow Hawk, 6; Blue Grouse, 1; Ruffed Grouse, 1; California Quail, 6; Ring-necked Pheasant, 503; Gray Partridge, 31; Am. Coot, 2,739±; Killdeer, 8; Common Snipe, 16; Herring Gull, 4; Rock Dove, 18; Mourning Dove, 42; Snowy Owl, 1; Short-eared Owl, 1; Belted Kingfisher, 3; Red-shafted Flicker, 56; Pileated Woodpecker, 2; Hairy Woodpecker, 1; Downy Woodpecker, 6; Horned Lark, 42; Steller's Jay, 8; Black-billed Magpie, 56; Common Raven, 11; Common Crow, 13; Black-capped Chickadee, 87; Mountain Chickadee, 9; Red-breasted Nuthatch, 14; Pygmy Nuthatch, 1; Brown Creeper, 2; Am. Dipper, 5; Winter Wren, 4; Varied Thrush, 1; Townsend's Solitaire, 2; Bohemian Waxwing, 312; Northern Shrike, 4; Starling, 11; House Sparrow, 887; Western Meadowlark, 65; Redwinged Blackbird, 5; Brewer's Blackbird, 15; Evening Grosbeak, 7; Cassin's Finch, 81; House Finch, 60; Pine Grosbeak, 22; Common Redpoll, 192; Pine Siskin, 45; Am. Goldfinch, 195; Slate-colored Junco, 2+; Oregon Junco, 159; Tree Sparrow, 1; Harris' Sparrow, 1; White-crowned Sparrow, 2; Song Sparrow, 75. Total, 75 species; 6,755 individuals. Seen during period: Hooded Merganser, 1; Rough-legged Hawk, 1; Golden Eagle, 2; Cooper's Hawk, 1; Am. Robin, 1; Rufous-sided Towhee, 1.

J. Arrand, Miss K. Bartholomew, K. Dobson, Mrs. K. Dobson, J. Ferguson, J. T. Fowle, J. Grant (compiler), A. N. Humphries, P. F. Mackie, J. Y. Obana, J. Phillips, D. Quirk, J. R. Quirk, D. A. Ross, I. Ross, Miss S. Ross, B. A. Sugden, E. van Blaricom, E. P. Venables (The Okanagan Naturalists' Club).

Victoria, B.C. (Sea front, sloughs, forest, marshes, tide flats, fields, lakes, creeks, within 20 miles of Victoria).—27 Dec., 1958; 8.15 a.m. to 4.45 p.m.; temp. 43° to 50°; wind SW, 5 to 10 m.p.h.; 22 observers in 9 parties. Total party hours, 57½ (43 on foot, 14½ by car); total party miles, 92 (28 on foot, 64 by car).

Common Loon, 36; Arctic Loon, 33; Red-throated Loon, 11; Red-necked Grebe, 41; Horned Grebe, 613; Eared Grebe, 34; Western Grebe, 554; Pied-billed Grebe, 15;

Double-crested Cormorant, 43; Pelagic Cormorant, 288; Great Blue Heron, 12; Canada Goose, 21; Mallard, 1608; Gadwall, 1; Pintail, 218; Green-winged Teal, 462; European Widgeon, 1; Am. Widgeon, 4061; Shoveler, 248; Wood Duck, 14; Ring-necked Duck, 1; Canvasback, 87; Greater Scaup, 2163; Lesser Scaup, 2; Common Goldeneye, 228; Bufflehead, 549; Oldsquaw, 48; Harlequin Duck, 107; White-winged Scoter, 258; Surf Scoter, 118; Common Scoter, 6; Ruddy Duck, 244; Hooded Merganser, 56; Common Merganser, 182; Red-breasted Merganser, 163; Sharp-shinned Hawk, 4; Cooper's Hawk, 3; Red-tailed Hawk, 4; Bald Eagle, 2; Peregrine Falcon, 1; Pigeon Hawk, 2; Sparrow Hawk, 4; California Quail, 227; Ring-necked Pheasant, 77; Am. Coot, 1031; Black Oystercatcher, 17; Killdeer, 80; Black Turnstone, 86; Common Snipe, 7; Purple Sandpiper, 35; Dunlin, 40; Glaucous-winged Gull, 2641; Herring Gull, 8; California Gull, 5; Ring-billed Gull, 1; Mew Gull, 929; Common Murre, 3; Pigeon Guillemot, 16; Marbled Murrelet, 23; Band-tailed Pigeon, 2; Rock Dove, 131; Short-eared Owl, 1; Belted Kingfisher, 20; Red-shafted Flicker, 125; Pileated Woodpecker, 2; Lewis' Woodpecker, 2; Yellow-bellied Sapsucker, 1; Hairy Woodpecker, 2; Downy Woodpecker, 20; Skylark, 85; Steller's Jay, 139; Common Raven, 21; Northwestern Crow, 1159; Chestnut-backed Chickadee, 255; Common Bushtit, 29; Red-breasted Nuthatch, 7; Brown Creeper, 17; Winter Wren, 29; Bewick's Wren, 37; Am. Robin, 7375; Varied Thrush, 43; Golden-crowned Kinglet, 282; Ruby-crowned Kinglet, 18; Northern Shrike, 5; Starling, 7747; House Sparrow, 620; Western Meadowlark, 126; Redwinged Blackbird, 371; Brewer's Blackbird, 409; Evening Grosbeak, 10; Purple Finch, 12; House Finch, 84; Pine Siskin, 196; Rufous-sided Towhee, 104; Oregon Junco, 464; White-crowned Sparrow, 10; Golden-crowned Sparrow, 60; Fox Sparrow, 38; Song Sparrow, 144. Total, 99 species, 37,974 individuals. Seen in count period: European Widgeon, 1; Black-bellied Plover, 24; Surfbird, 2; Red Crossbill, 7.

Mrs. H. M. Bell, K. R. Beckett, T. Briggs, K. Christiansen, J. O. Clay (compiler), A. R. Davidson, Mrs. A. G. Gosling, Mrs. G. J. Jackson, Ralph Joyner, Miss E. K. Lemon, Miss M. C. Melburn, Mrs. E. McGavin, B. Morgan, Mrs. B. Morgan, J. H. C. Palmer, Alan Poynter, Miss L. Roberts, Mrs. J. A. Sherman, Miss M. Slocombe, Mr. and Mrs. David Sterling, Philip Symons.

REPORT OF COUNCIL AT THE EIGHTIETH ANNUAL MEETING OF THE OTTAWA FIELD-NATURALISTS' CLUB, DECEMBER 4, 1958

SINCE the last Annual Meeting there have been six Council Meetings at the National Museum of Canada: December 20, 1957—12 present; March 13, 1958—17 present; April 24—8 present; September 25—16 present; October 30—10 present; November 25, 1958—19 present. The council continued to deal with the club's business.

Appointments for 1958 offices were made as follows:

Editor of the *Canadian Field-Naturalist*—Mr. R. A. Hamilton
Business Manager of the *Canadian Field-Naturalist*—Mr. W. J. Cody
Chairman, Publications Committee—Dr. W. J. Groves
Chairman, Excursions and Lectures Committee—Dr. Winston Sinclair

Chairman, Reserve Fund Committee—Mr. Hoyes Lloyd
 Chairman, Special Lectures Committee—Dr. É. L. Bousfield
 Chairman, Membership Committee—Mr. W. Winston Mair
 Chairman, Bird Census Committee—Dr. D. B. O. Savile
 Chairman, Macoun Field Club Committee—Dr. H. J. Scoggan
 Chairman, F.O.N. Affairs Committee—Mr. W. K. W. Baldwin
 Representatives, Canadian Section, International Committee for Bird Preservation—Mr. W. E. Godfrey, Dr. D. A. Munro

REPORT OF THE PUBLICATIONS COMMITTEE

During 1958 four numbers of the *Canadian Field-Naturalist*, Vol. 72, have been published. The material published in this volume is as follows:

	<i>Papers</i>	<i>Notes</i>	<i>Reviews</i>
Botany	2		1
Herpetology	3	1	7
Ichthyology			2
Invertebrate Zoology	3	1	1
Mammalogy	1	4	
Ornithology	5	17	8
Miscellaneous	1		8
	15	23	27

This comprises a total of 194 pages including 33 maps and illustrations. Accounts totaling \$3,649.31 have been approved by the committee.

There were no full sets, or nearly full sets, of the *Canadian Field-Naturalist* sold this year but sales of miscellaneous back numbers and some long runs totaling \$233.02 and sales of "The Geology of the Ottawa District" by Dr. Alice Wilson amounting to \$59.00 make a total of \$292.02.

Although a great number of letters were sent out to prospective advertisers: book publishers, book dealers, scientific and laboratory equipment companies, office equipment companies, camping and outdoor equipment companies, etc., the results in the form of advertising were not encouraging. Sale of advertising space amounted to \$50.00.

REPORT OF THE EXCURSIONS AND LECTURES COMMITTEE

During the year this committee arranged a series of spring field meetings, both in the form of early morning walks for birds and Saturday afternoon trips of a more general nature. The former began at the canal bridge on Bronson Avenue; the latter were held at the Rideau River at the new Bronson Avenue bridge, Taylor's Hill, the Lodge, and Hiawatha Park.

The Annual Dinner was held at the Administration Building of the Farm, and George Holland enthralled the group with an account of some of his adventures and observations in New Guinea. The Macoun Field Club prepared a display of its work; its senior officers were introduced, and they briefly spoke on the progress of the Club.

In conjunction with a rotunda display at the National Museum, the club were invited to a private viewing and a short program of talks and films in connection with it, through the courtesy of the director of the Museum.

The *Newsletter* has been conducted, as usual, by Dr. and Mrs. Kenneth Bowles.

The chairman being incapacitated, the work of the committee this year has been carried on by individual members.

REPORT OF THE RESERVE FUND COMMITTEE

The Reserve Fund Committee had no business before it. Its duty is to safeguard the capital assets of the Club. These assets have been donated by will, or otherwise, over a very long time; they have been handed down to us from the Club's savings during the past 79 years.

REPORT OF THE SPECIAL LECTURES COMMITTEE

Three Audubon Screen Tours completed the 1957-58 series:

January 20—Outdoor Almanac, by Charles Mohr.

March 1—Great Smoky Skyland, by G. Harrison Orians.

April 3—Forgotten Country, by Bert Harwell.

The following lectures of the eleventh season complete the program for 1958:

October 17—Yukon Indian Summer, by Cleveland P. Grant.

November 22—Cypress Kingdom, by Alexander Sprunt, Jr.

REPORT OF THE MEMBERSHIP COMMITTEE

The results of the membership campaign which was begun in November 1957 are best reflected in the mailing list for the *Canadian Field-Naturalist*. The October-December 1956 issue was mailed to 695 individuals and institutions, while the October-December 1958 issue will be mailed to 770, a net gain of 75. Most of this number were individuals from outside the Ottawa District.

The cost of printing and distributing the 5000 brochures was approximately \$155. The new members gained thus more than paid for the cost of the campaign. The percentage return from the brochures was roughly 1.5 percent.

In addition to these efforts to secure new members for the Club, two members of the Committee, Mr. Mair and Dr. Solman, have assisted in the evaluation of replies from a poll of Ottawa District members. The results of this evaluation may have far-reaching effects on the Club and, it is hoped, will help increase our membership.

REPORT OF THE BIRD CENSUS COMMITTEE

The 1957 Christmas Bird Census was held on December 22. A total of 4,611 birds of 40 species was seen by 37 observers. The Census for all Canada was published in the *Canadian Field-Naturalist*, Vol. 72, No. 1.

REPORT OF THE MACOUN FIELD CLUB COMMITTEE

The Macoun Field Club held its tenth birthday party at the National Museum on April 26, 1958. Badges were presented to qualifying new members on this occasion and prizes were awarded to the Junior and Intermediate winners of the attendance and merit game. Parents and other guests then viewed displays and projects prepared by Club members and enjoyed the birthday cake provided by the girls of the Senior group.

One winter, two spring, and six fall field trips were made to seven different localities, and weekly winter indoor meetings were held in the Club's room at the National Museum. The committee wishes to thank all those who provided leadership on the field trips or who gave talks at indoor meetings.

New officers were elected at a meeting in November. The new presidents are Connie Clark for Juniors, Joan Hart for Intermediates, and Henriette Hawksbridge for Seniors. Membership is at full strength, with over seventy members about equally divided between the three groups. Club activities included publication of two issues of the *Little Bear*, edited by Mr. Herbert Groh, ushering by the Seniors at the Audubon Screen Tours, and an exhibition of projects at the annual dinner of the O.F.-N.C.

REPORT OF F.O.N. AFFAIRS COMMITTEE

Liaison between our Club and the F.O.N. was maintained throughout the year. Two formal meetings were held. Informal consultation was more frequent. Miss Humphreys attended the 1958 F.O.N. summer camp.

The following items were dealt with:

1. Follow-up on changes of address of Ottawa members.
2. Liaison with Ottawa leaders in natural history of Girl Guide Association, Ontario Council.
3. Advance notice of O.F.-N.C. field trips.
4. The subject of Ontario lectures and lecturers.
5. Liaison with Dr. Soper representing our Club at F.O.N. executive.
6. Distribution of seed for winter bird food.
7. Consolidated report on activities of all Ontario natural history clubs.
8. Recruiting new executive secretary.
9. 1958 F.O.N. Summer Camp: display, information and publicity.
10. Christmas cards.
11. The Bluebird project.
12. Daily newspaper publicity — particularly bird records — throughout the province, by Hugh Halliday.

L. S. Russell, *President* A. W. F. Banfield, *Secretary*

Translations from the Russian

The fourth volume in the series "Translations of Russian Game Reports" is announced by the Canadian Wildlife Service. It is "The Bird Bazaars of Novaya Zemlya," by S. M. Uspenski, and may be had from The Queen's Printer, Ottawa, Ontario, for \$1.00. A check or money order should be made payable to the Receiver General of Canada.

FINANCIAL STATEMENT OF THE OTTAWA FIELD-NATURALISTS' CLUB, DEC. 1, 1958

CURRENT ACCOUNT

ASSETS

Balance in Bank, Dec. 1, 1958....	\$2,002.72
Bills receivable, separates.....	38.73
lodge.....	35.00
	<u>\$2,076.45</u>

RECEIPTS

Balance in Bank, Dec. 2, 1957....	\$1,569.43
Fees:	
Current.....	\$1,932.70
Adv. and Arrears....	492.34
Contrib.....	74.00
Assoc.....	34.00
	<u>2,533.04</u>
Separates and Illustrations.....	1,270.24
Sale Wilson Geology.....	59.00
Single and Back Numbers.....	176.52
Advertising, C.F.N.....	50.00
Donation, Fed. Ont. Nat.....	25.00
From Reserve and Public. Funds..	375.00
Miscellaneous.....	49.25
Audubon Screen Tours, net.....	14.29
	<u>\$6,121.77</u>

LIABILITIES

Audubon Screen Tours guarantee \$	750.00
Cheque outstanding.....	100.00
Balance.....	<u>1,226.45</u>
	<u>\$2,076.45</u>

EXPENDITURES

Can. Field Nat. (4 numbers).....	\$2,742.74
Separates and Illustrations.....	734.78
Editor's honorarium.....	100.00
Business Manager's honorarium..	15.00
Membership Committee.....	88.00
Excursions and Lectures	
Committee.....	100.00
Newsletter (1 number).....	52.80
Lodge insurance.....	26.50
Postage and Stationery.....	288.34
Bank discount.....	28.95
Foreign exchange.....	17.10
Miscellaneous.....	24.84
Bank Balance,	
Dec. 1, 1958.....	\$2,002.72
less o/s cheque.....	<u>100.00</u>
	<u>1,902.72</u>
	<u><u>\$6,121.77</u></u>

RESERVE FUND

ASSETS

\$3,000 Ontario Hydro 3% bonds, market value.....	\$2,550.00
13 shares Bell Telephone stock, market value.....	546.00
Balance in Bank, Dec. 1, 1958....	63.76
	<u>\$3,159.76</u>

RECEIPTS

Balance in Bank, Dec. 2, 1957....	\$ 175.33
Bank interest.....	2.43
Bond interest.....	90.00
Dividend Bell Telephone.....	26.00
	<u>\$ 293.76</u>

LIABILITIES

NIL

EXPENDITURES

Rent safety deposit box.....	\$ 5.00
To Current Account.....	225.00
Balance in Bank, Dec. 1, 1958...	63.76
	<u>\$ 293.76</u>

PUBLICATIONS FUND

ASSETS

\$1,500 Ontario Hydro 3% Bonds, market value.....	\$1,275.00
Balance in Bank, Dec. 1, 1958....	49.38
	<u>\$1,324.38</u>

RECEIPTS

Balance in Bank, Dec. 2, 1957....	\$ 152.41
Bank interest.....	1.97
Bond interest.....	45.00
	<u>\$ 199.38</u>

LIABILITIES

NIL

EXPENDITURES

To Current Account.....	\$ 150.00
Balance in Bank Dec. 1, 1958...	49.38
	<u>\$ 199.38</u>

Audited and found correct.
Dec. 1, 1958

(Signed) I. L. CONNERS
C. FRANKTON
Auditors

(Signed) R. J. MOORE
Treasurer

NOTES

Beetles as Parasites of Mammals

AMONG the least known ectoparasites of mammals are certain beetles of superfamily Staphylinoidea. The tribe Amblyopinini, in the family Staphylinidae, includes one monotypic genus that is parasitic on Tasmanian rodents and four genera containing a total of 30 species that are parasitic on neotropical rodents and marsupials (Seevers, C.H. Fieldiana, Zool. 37: 211-264. 1955). The family Platypsyllidae contains one species, *Platypsyllus castoris* Ritsema, found on the American beaver *Castor canadensis* (Spencer, G. J. Proc. ent. Soc. B.C. 53: 21-22. 1957).

The family Leptinidae has been reviewed recently by Parks and Barnes (Ann. ent. Soc. Amer. 48:417-421. 1955), and Spencer (1957) has given additional records. Parks and Barnes list three genera and seven species from Europe, Asia, Africa, and North America. The taxonomy and distribution of these forms are poorly known and some of them are probably not valid. Three species are recognized from North America: *Leptinus americanus* Leconte, parasitic on rodents and insectivores; *Leptinillus validus* Horn, parasitic on *Castor canadensis*; and *Leptinillus aplo-dontiae* Ferris, parasitic on the mountain beaver *Aplodontia rufa*. These species are known from only a few records. The two species of *Leptinillus* are presumably limited to the ranges of their hosts. *Leptinus americanus* has been taken at scattered localities from Canada to Alabama and from the Pacific coast to New York.

The writer has collected nine specimens of *L. americanus* from shrews in British Columbia: one from *Sorex* sp., Silver Hill Mine, Treasure Mountain, Tulameen, B.C., August 12, 1955 (Spencer, 1957); two from two individuals of *Sorex obscurus*, Cultus Lake, B.C., June 23, 1956; and six from five

individuals of *Sorex (vagrans?)*, Looen Lake, Haney, B.C., August 30 to September 2, 1957. Prof. G. J. Spencer identified these specimens and pointed out to me their significance. These specimens were the only ones collected during three summers spent trapping small mammals in this area. Most of the mammals were snap-trapped and some beetles may have left their hosts before these were examined. Other workers have found *L. americanus* most abundant in winter, and these summer collections may give too low an indication of their abundance.

The relation of these beetles to their hosts is not well known, but they seem to be true parasites, feeding on dead skin, bits of hair, and sebaceous secretions. Their specialized mouth parts, dorsoventral flattening, and loss of eyes and membranous wings indicate that they are specialized for parasitism. These beetles have been reported from nests as well as hosts, and, like fleas, they apparently live on the host only intermittently (Parks and Barnes, 1955).

Many more records of all these beetles are needed and small-mammal collectors should be alert for them. *L. americanus* is especially needed. It can be distinguished from the carrion beetles which sometimes attack carcasses, by its small size (about two mm long), dorsoventral flattening, and light brown color. The beetles may be mounted on points or preserved in 70 percent alcohol. Prof. G. J. Spencer, Department of Zoology, University of British Columbia, Vancouver, British Columbia, would be glad to receive beetles found on mammals for examination and identification.

WALTER SHEPPE

Department of Zoology
Vassar College
Poughkeepsie, New York
12 May 1958

Revision of Some Triassic Ammonoids, Peace River Foothills, British Columbia¹

IN A WORK ON Upper Triassic ammonoids recently completed and now awaiting publication, I have made some revision of generic assignments. Many of the species were first named in the *Canadian Field-Naturalist* so it is thought fitting to present a prepublication announcement of these changes in this journal.

Sirenites pardoneti McLearn (Can. Field Nat. 54:115, 1940) and similar species are now included in *Pseudosirenites* Arthaber. The genus *Vredenburgites* Diener is recognized. *Indoclinonites*? is recorded in the *Monotis subcircularis* zone. *Thisbites charybdis* (Gemmellaro) and *T. cf. pyrami* (Gemmellaro) are in the *Styrites ireneanus* zone. The ventral tubercles and ventral keel of *Thisbites dawsoni* (McLearn) (Can. Field Nat. 54:49, 1940) and *T. custi* (McLearn) (Can. Field Nat. 54:49, 1940) disappear adorally, are fainter than in *T. charybdis* and are by no means as well defined as in Alpine *T. agricolae* Mojsisovics. '*Heraclites*'? *exquisitus* McLearn (Geol. Surv. Canada, Paper 47-14, Appendix, p. 1, 1947) is included in *Thetidites* Mojsisovics. *Tropites* is recorded by only one specimen in place and at a horizon above the *Stikinoceras* zone and in the major *Gonionotites-Malayites* zone.

Although the genus *Halorites* Mojsisovics is not recorded, the family Haloritidae is well represented. *Juvavites* (*Griesbachites*) *caurinus* McLearn (Geol. Surv. Canada, Paper 47-14, 1947) is now placed in synonymy with *J. (Anatomites) humi* McLearn (Can. Field Nat. 51:130, 1937). The genus *Griesbachites* as now defined by Spath, that is, with ventrolateral tubercles on the phragmocone, does not occur in Geological Survey collections. These tubercles, however, are found on the body chamber of *J. selwyni* Mc-

Learn (Can. Field Nat. 54:113, 1940), the revised *J. (Anatomites) humi* and on some *Gonionotites*. A single, poor specimen of *Guembelites* occurs in the *Pterotoceras-Cyrtopleurites magnificus* beds, suggesting a correlation with the *Styrites-Guembelites* zone of Nevada. Inner whorls of *Gonionotites* are ribbed, costate to smooth. *Juvavites clavatus* McLearn (Trans. Roy. Soc. Canada, 3rd ser., sec. 4, vol. 33, p. 51, 1939), with clavi at the ends of faint ribs is included in *Gonionotites*. *Malayites* includes typical species of the genus, and, in addition, smooth or nearly smooth species with very fine strigation, *Malayites parvus* (McLearn) (Can. Field Nat. 54:115, 1940), *M. custi* (McLearn) (Can. Field Nat. 54:113, 1940) and *M. bococki* (McLearn) (Can. Field Nat. 51:98, 1937).

FRANK H. McLEARN

817 Ivanhoe Avenue
Britannia Heights Post Office
Ottawa, Ontario
2 December 1958

Flowering Rush in Nova Scotia

ON JULY 19, 1958, Dr. J. F. Hockey collected an unfamiliar aquatic plant from a lily pond at Annapolis Royal, Annapolis County, Nova Scotia, and brought it to the laboratory for identification. It turned out to be *Butomus umbellatus* L., not previously known in Nova Scotia.

The former garden pool, about 200 feet in diameter, was nearly full of silt, and so provided a suitable habitat for this plant and many native aquatic or semi-aquatic plants such as *Typha latifolia*.

Since a small stream flows through the pond, the possibility of the seeds and rhizomes being carried downstream and infesting the valuable dike land in the area is very real. As the owner of the property, Mr. P. Prescesky, is a native of Montreal the plant could possibly have been introduced from that area where it first became established about 60 years ago and now dominates the flats of the St. Lawrence River as far as the

¹Published with the permission of the Director, Geological Survey of Canada, Department of Mines and Technical Surveys, Ottawa, Ontario.

region of fresh water below Quebec. Gaiser (Rhodora 51: 385-390, 1949) gives a good summary of the history of this plant in North America.

Specimens have been deposited in the Department of Agriculture herbarium, Ottawa, and the herbarium of Acadia University in Wolfville, Nova Scotia.

IVAN VICTOR HALL

Plant Pathology Laboratory
Kentville, Nova Scotia
23 July 1958

The Gray Fox, A Manitoba Record

R. M. ANDERSON in his "Catalogue of Canadian Recent Mammals" (Bull. nat. Mus. Canada 102:50, 1946) gives one Canadian record of the Wisconsin Gray Fox *Urocyon cinereoargenteus ocythous* taken in the Rainy River district of western Ontario. Anderson states that "the gray fox is known to be extending its range northward in both east and west, coincident with the continuing northward spread of the cottontail rabbit (*Sylvilagus* spp.), and should be looked for in southern Manitoba.

Another, and rather startling occurrence of the same subspecies, is recorded by J. E. Moore (J. Mammal. 33:253, 1952) for Lake Athabasca, Alberta, in 1950.

Other records, though not from Canada, are those presented by Viola S. Schantz (J. Mammal. 31: 197-198, 1950) from Wilton, North Dakota, 1942, and Minot, North Dakota, 1943, respectively 120 and 60 miles south of the international boundary. These, together with the Rainy River specimen, have indicated, as Anderson points out, that the Gray Fox might be expected in Manitoba. We now have that record.

On January 12, 1957, Mr. Marcel Bouchard, of St. Adolphe, Manitoba, trapped an animal which, on being submitted to the fur buyers, was rejected as "an American fox." Mr. Bouchard then

took the pelt to J. P. Hawkins, taxidermist, who recognized it and immediately notified the Manitoba Museum. Through the courtesy of Mr. Bouchard we now have the pelt and skull of the animal. It is an old male. Subspecific determination was made through the courtesy of Dr. Austin W. Cameron, National Museum of Canada, and Dr. Charles P. Lyman, Museum of Comparative Zoology, Cambridge, Mass.

St. Adolphe is some 20 miles south of Winnipeg. If we exclude the Lake Athabasca specimen (800 miles north of normal range) as an abnormal occurrence, the Manitoba specimen extends the known northward range of the Wisconsin Gray Fox by about 80 miles.

A careful check with local fur buyers reveals only one other probable occurrence in Manitoba. Mr. A. Suchrov, buyer for S. I. Robinson Company, recalls handling a single pelt taken at Sprague, in southeastern Manitoba, in 1946 or 1947.

RICHARD W. SUTTON

Manitoba Museum
Winnipeg, Manitoba
2 July 1957

Mandt's Black Guillemot Breeding on the Hudson Bay Coast of Ontario

A NUMBER of specimens of the Mandt's Black Guillemot *Cepphus grylle ultimus* have been taken on the Hudson Bay and James Bay coasts of Ontario.

In the Royal Ontario Museum of Zoology and Palaeontology there is a specimen picked up by an Indian in April 1942, 40 miles west of Fort Severn. Manning, in his "Birds of the west James Bay and Southern Hudson Bay Coasts" (Bull. nat. Mus. Canada 125, 1952), mentions sight records on the James Bay coast of Ontario 15 miles south of Cape Henrietta Maria and also about 30 miles west of the Cape near a small island where, he suggests, Mandt's Black Guille-

mot might have nested. According to an unpublished diary by C. E. Hope in the Royal Ontario Museum of Zoology a field party of this museum collected specimens south of the Cape in 1948.

On the Hudson Bay coast 22 miles west of Cape Henrietta Maria, at about 55° 10' N. 82° 39' W., lies a small peninsula which becomes an island at high tide and is called Manchuinagush by the Indians. Its north shore is high and is covered with a jumble of boulders probably piled by ice action. On July 12, 1957, while the writer was rounding this point in a boat he disturbed a flock of about 80 Mandt's Black Guillemots among the boulders. A brief search yielded part of the shell

of a hatched egg of the species. Two specimens, a male and a female, were collected. Both had well-developed brood patches. This appears to constitute the first breeding record for the Mandt's Black Guillemot in Ontario. The specimens are in the Royal Ontario Museum of Zoology. The writer wishes to acknowledge permission given by Mr. L. L. Snyder, Curator of Birds, to publish these records.

H. G. LUMSDEN

Southern Research Station
Ontario Department of Lands and Forests
Maple, Ontario
9 May 1958

REVIEWS

Algae, the Grass of Many Waters

By LEWIS HANFORD TIFFANY. 2d ed. Springfield, Ill. Thomas, 1958. 199 p. \$7.25.

This delightful little book, now in its second edition, continues to give the reviewer the same satisfaction he had when he first read it twenty years ago. It is certainly not a monograph, nor is it a textbook; far too many of these forms of literature remain ponderous and dull. The author admits that this "volume was originally written for the sheer fun of putting down on paper some interesting things about the algae." In this, he has succeeded. The presentation is interesting and imparts occasional touches of humor and stimulating speculation.

Dr. Tiffany poses many questions for the intellectually curious. What are the pond scums and seaweeds? Where do they get their food? How do they reproduce? Where do they grow? And, in supplying the answers, he avoids as far as possible the technical terms of morphology, taxonomy and physiology.

Although not written for specialists, the book contains much to interest them and perhaps to indicate new lines of research. Problems of distribution and productivity, the food chain, the origin of life and the control of noxious algae,

all receive the author's attention. The "algae of bizarre abodes," epiphytes, parasites, endozoic and epizoic species, compete for the readers' interest with snow, soil and fossil algae.

The new edition differs from the first chiefly by the addition of one short chapter that draws attention to some of the recent progress in algal research. Advances have been made in laboratory and mass culture techniques and in the use of algae as foods. Our knowledge of nitrogen-fixation, photosynthesis, pigmentation and toxicity of algae is now more complete. Occasional references to recent work have been inserted in the rest of the text; a few new figures have been added or substituted for old ones; but the bulk of the book remains unchanged. For those who already have a copy of the original volume, these changes are hardly sufficient to justify purchase of the second edition.

The book is printed on good quality glossy paper and well bound. The colored plates of the first edition now appear in black and white. The price of the book is high, possibly because of the large number of illustrations.

ELWYN O. HUGHES

Comparative Biosystematics and Life History of the Nuthatches *Sitta pygmaea* and *Sitta pusilla*

By ROBERT A. NORRIS. Berkeley, University of California Press, 1958. \$3.50. (Univ. Calif. Publ. Zool. 56:119-300)

When Margaret M. Nice published her now world-famous life history study of the Song Sparrow, she established a type-pattern for such studies based upon meticulous field observations. This pattern emphasized, above all, the importance of studying purely commonplace behavior, the knowledge of which she felt was a prerequisite for our thorough understanding of a given species—a kind of study that North American ornithologists hitherto had rather omitted because the time-consuming and patience-craving means of continuous watching was unsuspected of yielding the deepest secrets of birds' lives and being.

In this treatise concerning two species of Sittidae, Robert Norris has further improved upon Nice's ornithologically epoch-making work. In an undertaking of equal thoroughness and care of details, he has produced here a comparison between the life and behavior of two closely related nuthatches, furnishing excellent foundation for determining the reasons why these two must be separated into distinctly different noninterbreeding species as well as for exposing their degree of interrelationship. The whole of this remarkable work is drawn from an accumulation of data comprising systematics and certain physiological aspects, and amazing revelations about the birds' everyday life throughout their annual cycle.

It would be impossible within limited space to analyze even the highlights of this work. Significant revelations of behavior are contained in every chapter. Each phase of behavior is first treated separately in *pygmaea* and *pusilla*, then summarized and compared in comprehensive tables of similarities and dissimilarities. There is an interesting chapter on the incidence of threesomes and sex ratio. The author discovered—and

his find must have presented a great puzzler at first—that two males and a female (never two females and a male) attended certain nests in both species. In these threesomes one male consistently remained in the role of primary attendant, being the real mate of the female and father to the young, while the other never attained a higher position than that of secondary helper, except sometimes in the case of the primary male's demise.

The chapter on roosting is excellent and must have required intensive watching. Here Norris discusses roosting behavior during the breeding and early postbreeding seasons as well as during the nonbreeding periods, times of roosting and awakening, composition of winter roosting groups. Through color banding he found that gregarious roosting was habitual in both species. *Pygmaea* always roosted in cavities; *pusilla* did so until the fledging of the young, after which time this species roosted in the open. 'Visiting' adults were accepted on roost by *pygmaea* but not by *pusilla*. After fledging, *pygmaea* returned with the family to roost in the nest cavity, as a rule, the parents 'ushering' the fledglings 'indoors' and 'putting them to bed' before entering themselves, the males settling to rest always after the females and emerging first in the morning. By a "stroke of luck" the author observed the following event: The secondary male of a threesome attending Nest 85 was frightened away by trapping and banding. He was presently discovered as a roosting 'visitor' in Nest 11. Emerging after the male of the pair nesting in this cavity the following morning, he brought food at least twice to the nestlings within, "as if paying for his night's lodging." After this he again resumed his role as helper at Nest 85. When the young of this nest fledged, the whole family with helper abandoned the cavity because of its unsafe condition and all went to roost in Nest 11, uninvited, one might say. The original inhabitants of this nest numbered three, the male and two young, after the female deserted upon the removal of two

addled eggs. Thus together with the six 'guests,' this mixed group of nine nut-hatches roosted peacefully in the same cavity until late summer. This is a good example of the author's keen observing.

If a single word of criticism should be uttered about so nearly perfect a piece of work, one might mention the somewhat heavy style which at times slightly mars the readability of the discussions. Doubtless, however, this exhaustive paper might well serve as an excellent model for the composition of a complete life history study and the multitude of important aspects it could and should contain, and thereby is the author's contribution to science qualitatively outstanding.

LOUISE DE KIRILINE LAWRENCE

Birds of Maryland and the District of Columbia

By ROBERT E. STEWART and CHANDLER S. ROBBINS. North American Fauna No. 62, U.S. Department of the Interior, 1958. For sale by the Superintendent of Documents, Washington 25, D.C. 401 p. \$1.75.

This paper-covered book well supplies what the modern ornithologist requires in a regional bird book. Unlike most books of the type it does not include verbal or graphic descriptions of plumages, field marks, songs or other manifestations of behavior. Each species is treated under several, or all, of the following headings: status, habitat, spring migration, nesting season, fall migration, breeding population densities, maximum counts, and banding. There are distribution maps for a number of the breeding species, principally those not widely distributed; and for some species there are charts depicting banding recoveries.

In the introductory section there are references to the history of ornithology in Maryland and the relationship between bird life and changing practices in land use. The six biotic areas of Maryland, and the three forest regions into which they are grouped are carefully described and the birds that are characteristic of each are listed.

DAVID A. MUNRO

Spring Flowers of the Lower Columbia River

By CLARA CHAPMAN HILL. Illustrated by Mary Comber Miles. Seattle, Univ. of Washington Press, 1958. 164 p. \$3.00.

Although this book is limited to the spring flora of the immediate vicinity of Portland, Oregon, it should be of interest to naturalists throughout the Pacific northwest. Almost 200 species are briefly described, their ranges given, and pertinent notes on each included. The 71 full-page line drawings complement the descriptions and enable rapid identification of many of the species. The technical terms are briefly defined in the introduction and glossary, and there is a simplified generic key. Throughout the text, species keys have been included for the more difficult genera.

The author's notes, which should appeal to all readers, include for many species: the derivation of the common and scientific names, their suitability and adaptability for cultivation, their edible or toxic properties, and the uses to which they have been put by the Indians.

As most of the species are present in the coastal region near Vancouver and on southern Vancouver Island, it will be a useful book for nature lovers and amateur botanists of southwestern British Columbia.

JOHN A. CALDER

Botany and Plant Pathology
Laboratory, Ottawa

The Mammals of Banks Island

By T. H. MANNING and A. H. MACPHERSON. Montreal, Arctic Institute of North America, 1958. 74 p. Price to Institute members \$1.00, to nonmembers \$2.00.

An annotated list of 13 species of mammals observed and collected during three years of field work, 1951 to 1953. The data is based upon a collection of 402 specimens, and the published records of other visitors to the Island. Two new local subspecies are described: *Lepus arcticus banksicola* and *Lemmus trimuncronatus phaiocephalus*.

A. W. F. BANFIELD

A Guide to the Aging of Pheasant Embryos

By RONALD F. LABISKY and JAMES F. OPSAHL.
Urbana, Illinois Natural History Survey,
1958. 4 p. Free. (Biological Notes No. 39)

This paper presents a series of photographs illustrating the chronological sequence on the development of pheasant embryos as an aid to identification of incubation stages of pheasant eggs found in the field. Prominent characteristics of embryos of various ages are described. It would appear to be a useful publication.

DAVID A. MUNRO

Geology of The Great Lakes

By JACK L. HOUGH. Urbana, University of Illinois Press, 1958. 313 p. \$8.50.

This is a volume of great value to the professional geologist who desires a summary of the information now available on the Pleistocene and Recent history of the Great Lakes region. The book is also of great interest to the general reader intrigued by the fascinating story of the evolution of these lakes, their old strand lines marking their extent at various earlier stages, their outlet changes, and the dates and reasons for these changes.

The volume is in two parts. In the present Great Lakes are discussed: their depths, the topography of the lake bottoms, and their geological setting. The author continues with a description of the lake water itself, wave action, tides, surface currents, seiches, ice, thermal stratification and deep circulation, precipitation and evaporation, the chemistry of the water and the character of the sediments that accumulate in it. The bedrock geology of the region is summarized. It includes the highlights of Precambrian history and the events of Paleozoic and later geological time including reference to preglacial erosion surfaces and drainage systems. Special attention is given to the Pleistocene history with its four ages, the Nebraskan, Kansan, Illinoian and Wisconsin, and to the various substages of the latest of these as determined from the study of the order of superposition of deposits, soil

horizons and erosion surfaces. The problem of the absolute measurements of age from various lines of evidence such as the rate of soil formation on glacial deposits, the length of time it has taken to cut the Niagara gorge, the counting of varves in stratified lake clays, the uranium-ionium-radium method used on marine sediments, and the radiocarbon method comprise what will be to many one of the most interesting sections. The last of these methods furnishes evidence that the time in years since the final disappearance of the Wisconsin ice from the region is considerably less than had formerly been thought.

Part Two consists of a detailed and technical account of the various changes from the earliest known lakes formed when the Wisconsin ice first began to retreat through times of readvances and later retreats until the lakes reached their present stage. Of great help to the reader in following the succession of events is a series of twenty-six maps showing the areas accupied by the lakes at these various times. Diagrams, tables, a list of beach levels and a fourteen-page bibliography also add greatly to the value of the volume.

F. J. ALCOCK

Former Director
National Museum of Canada

Investigations of Ring-Necked Pheasants in Illinois

By WILLIAM B. ROBERTSON, Jr. Springfield, Illinois, Department of Conservation, 1958. 137 p. Free (Technical Bulletin No. 1)

This publication, the first in a new series sponsored by the Illinois Department of Conservation, has been prepared by Mr. Robertson chiefly from quarterly Progress Reports of the Pittman-Robertson Project 30-R. The book, a synthesis of the works of various project personnel arranged and interpreted by the author, aims primarily at providing a readable summary of their findings in relation to pheasant research done by others elsewhere.

The study is comprehensive and con-

siders the problems and management of pheasants as they arise in seasonal order. Preliminary discussion includes a well-documented account of the introduction and early history of pheasants in Illinois and the pattern of population establishment throughout the pheasant range to date.

Winter trapping operations provide information on pheasant weight changes, rate of bursal involution, age ratios, and dispersal. Spring studies include data and discussion on census of cocks and an apparent differential in the attainment of breeding age in both cocks and hens.

Nesting studies conducted for four consecutive years (1947-50) show farm operations to be the greatest single cause of nest failure. In large measure, agricultural influence on nesting success was modified considerably by spring weather. Investigation of the use of flushing bars during the cutting of alfalfa proved this method of reducing nest and hen mortality to be ineffective under the conditions generally prevailing for mowing in Illinois.

Information on the fall pheasant harvest show weather and the state of the grain harvest to have strong influence on hunting pressure and hunter success.

The effects of artificial stocking on the harvest were studied to determine the direct return from cocks bagged during the hunting season and the contribution of mass releases of hens to the net pheasant production. It was found that the recovery rate for summer-released cocks ranged from 35% to 50% and about 6.1% for those released in the spring. Fall releases of adult hens in two different study areas were estimated to have increased brood production by 25% and 46%.

The author concludes with a discussion of some limitations of the pheasant range in Illinois and suggests that regional nutritional deficiencies and the adverse effects of high temperatures on hatchability of eggs contribute to the geographic pattern of pheasant distribution.

This paper achieves quite ably the author's aim to consolidate the knowledge gained from the various Illinois studies. While it reveals no new discoveries of a basic nature it will serve as a useful reference to further studies within the state and will lend perspective to the consideration of pheasant management in other regions of the continent.

E. W. TAYLOR

Game Management Biologist
British Columbia Department of
Recreation and Conservation

Symbolism in Flower Arrangement

By ERVIN S. FERRY. New York, Macmillan, 1958. 149 p. \$4.95.

This book should have special appeal to those who seek to make a flower arrangement more than just an artistic grouping of flowers.

The introduction to flower arrangement is excellent and contains much more than the few pages would indicate. The careful details of the Japanese schools and styles of flower arrangements and the chapter on "bases of flower symbolism" form adequate backgrounds for a discussion of "symbolism in flower arrangement." The special creations by Mrs. Makoto Kajiwara are especially beautiful and illustrate the deceptively simple lines of Japanese arrangements.

However, it is doubtful whether the author succeeded in his aim "to reveal the conditions under which a plant or flower composition may evoke an idea, convey a message or arouse an emotion in the mind of the viewer." The author introduces a number of topics which are only vaguely related to the title. Over one-third of the book is devoted to flower lore, "a bit of history," training of a flower master in Japan, and hints on handling flowers. All of this is interesting but there is surprisingly little discussion of symbolism in flower arrangement per se. While most of the information in the chapter entitled "Helps in Handling Flowers" is useful not all of it is accurate.

A. P. CHAN

Senior Horticulturist
Canada Department of Agriculture

A Guide to Saskatchewan Mammals

By W. H. BECK. Regina, Saskatchewan Natural History Society and the Saskatchewan Museum of Natural History. 1958. 52 p., illus. 50 cents.

The present booklet fills a great need for definite distributional information on the mammals of Saskatchewan, and will be particularly welcomed by zoologists of the prairie provinces. The mammals of western Canada are now reasonably well covered by three excellent provincial compilations: the present booklet, Cowan and Guiguet's "The Mammals of British Columbia" (1956) and A. L. Rand's "Mammals of the Eastern Rockies and Western Plains of Canada" (1948) which might be subtitled "Mammals of Alberta." We could only wish that Eastern Canada were as well covered by larger regional works. Manitoba, Ontario and Quebec, for example, still lack recent comprehensive coverage.

"A Guide to Saskatchewan Mammals" treats each species recorded for the province and gives brief descriptions of each and a list of specimen and sight records. These records are plotted on small maps of the province, which help immeasurably in pin-pointing localities. The distributional information is by far the most valuable part of the publication. A number of the species are illustrated by photographs, and there are line drawings of dental patterns and other diagnostic characters.

This reviewer would have liked a more detailed general map of the province so that the smaller and lesser-known localities mentioned in the text could be easily found. Perhaps, also, in future editions, some of the descriptions might be more detailed, particularly those of the smaller species that are often difficult for the amateur to identify.

The author and the Saskatchewan Natural History Society are to be complimented on the excellence of this publication, which should enjoy a large demand.

AUSTIN W. CAMERON

Curator of Mammals
National Museum of Canada

Variation and Systematic Relationships Within the Salamander Genus *Taricha*

By WILLIAM J. RIEMER. Berkeley, University of California Press, 1958. \$2.00. (Univ. Calif. Publ. Zool. 56:301-390)

This precise, succinct, articulate study of the west coast newts is recommended to the naturalist who wishes to know something of the challenge of vertebrate taxonomy and also to the professional taxonomist as a model study, worthy of emulation. Rather simple statistics, graphs, tables, and drawings are employed most effectively and are accompanied by explanations of the use, misuse and limitations of each method.

New species and subspecies of the western newt *Taricha* (formerly *Triturus*) have been described with the discovery of every new vagary that appeared in collections, with little attention being paid to the possible origin and dispersal history of these forms. Dr. Reimer has selected 22 samples of over 50 specimens each (in most cases) from rather regularly spaced areas over the entire range of the genus. Five body measurements and eight pigment pattern characters are applied to each sample and the variation of each character plotted. His analysis of this data is fascinating. In certain populations one character may be clinal south to north, in another the same feature shows no variation, and in a third series it may be clinal from the center outward so that specimens geographically distant are most similar.

An interesting sidelight is that one full species of some authors, *T. klauberi*, is actually a population of individuals whose distinct warty appearance is a pathological condition. In the past 22 years the percentage of diseased individuals has declined from 88 to 4.

In the final analysis, Dr. Reimer recognizes only three species: a generalized *granulosa* which gave rise to *rivularis* and *torosa*. In some areas two or even all three species may coexist. This has important bearing on laboratory research since this newt is a favorite experimental animal in California. Few indoor re-

search teams appreciate the importance of sound taxonomic studies as a prerequisite to their experimental work. Many projects have been conducted with Californian newts as subjects, but rarely do the authors report where the specimens were obtained nor do they preserve any for identification by a taxonomist. Their experiments can thus never be repeated for verification of results because it is not known which of the three possible species, each physiologically distinct, they may have employed. Conflicting results from repeated experiments are often due to this indiscriminate selection of material.

Dr. Riemer's study is based mainly on analysis of adult material. A comparative study of the life histories and behavior patterns of the three species and their races, he points out, are taxonomic aspects not yet investigated.

S. BLEAKNEY

Acadia University

Animal Tracks and Hunter Signs

By ERNEST THOMPSON SETON. Garden City, Doubleday, 1958. 160 p., illus. \$4.25.

Naturalists who are familiar with those great natural history classics, *Lives of Game Animals* and *Wild Animals I have Known* will need no introduction to the author of the book under review. Many older readers, and some not so old, will have been nurtured by the writings of Ernest Thompson Seton and will receive *Animal Tracks and Hunter Signs* with a touch of nostalgia. Those who have been unfortunate enough to have missed these earlier works will want the present volume for both its information and historical value.

This is a beginner's book, designed as a guide to the tracks of animals most likely to be encountered by the amateur naturalist. As might be expected, domestic animals and pets are treated first since the novice has already some familiarity

with their tracks and can use them as standards of comparison in studying the marks left by lesser-known species. From there, he can graduate to the wild animals found on the average farm—the red fox, ermine, meadow mouse and deer mouse, to name only a few. Later, ranging farther afield, he can make the acquaintance of the mink, coyote and perhaps even the wolf.

The book is profusely illustrated throughout with at least one sketch of the tracks of each species mentioned. In most cases, there are several drawings of the tracks made under different circumstances, such as when the animal is running, resting or being pursued. Many of the tracks are depicted in life size, which helps greatly in identifying the track of an animal with which the reader is not familiar.

Several chapters are devoted to the interpretation of animal trails, and these sections will appeal to the naturalist who is not content to merely observe. The sequence of events that ensue when a skunk and bobcat meet, for example, can be readily interpreted by the tracks, an episode which the author has sketched for the reader's benefit.

An interesting chapter is the one devoted to blazes and Indian signs. This will appeal particularly to the younger naturalist. Another chapter deals with techniques for obtaining foot imprints, using inks, soft mud or dust patches.

Animal Tracks and Hunter Signs can be heartily endorsed for naturalists of all ages. Track identification is not something that can be learned on a few field trips, nor even after several seasons; but when the novice has gained some mastery of the technique he can take considerable pride in his accomplishments and will thereby derive a great deal more pleasure from his outings.

AUSTIN W. CAMERON

Curator of Mammals
National Museum of Canada



SOUNDS OF NATURE

33 1/3 RPM Records

*Produced for the
Federation of Ontario
Naturalists*

by

WILLIAM W. H. GUNN

Production of these records has become one of the best-known activities of the Federation of Ontario Naturalists. In this series are transcribed the beauty and charm of the natural sounds of the out-of-doors.



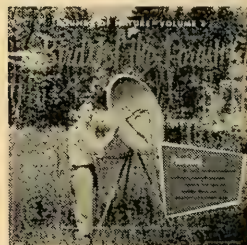
VOL. 1. SONGS OF SPRING

Representative songs of 25 Songbirds common in southern Ontario and adjacent states of the U.S.
10"—\$4.95



VOL. 2. A DAY IN ALGONQUIN PARK

A Symphony of Nature from the Land of the Loon.
12"—\$5.95



VOL. 3. BIRDS OF THE FOREST

A skilful blending of narration by Thom Benson and songs of 22 species of birds that regularly breed in Ontario.
12"—\$5.95



VOL. 4. WARBLERS

Songs of the 38 species of Warblers known to breed regularly in eastern North America. Compiled in conjunction with Dr. Donald Borror.
12"—\$5.95

and just released

VOL. 5. A DAY AT FLORES MORADES

"Sounds of the Tropics"

Recorded at the Ranch of the Purple Blue Flowers, Venezuela.

12"—\$5.95

An illustrated folder is available on request from

Federation of Ontario Naturalists

187 Highbourne Road



Toronto 7, Ontario

AFFILIATED SOCIETIES

British Columbia Bird and Mammal Society

President, M. D. F. UDVARDY, Dept. of Zoology, University of British Columbia, Vancouver 8, B.C.

Edmonton Bird Club

President, PROF. W. R. SALT; *Vice-President*, DR. K. BALL, *Secretary-Treasurer*, W. G. LAWRENCE TWIGG, 11343 67th St., Edmonton, Alta.; *Field Secretary*, H. C. PEGG; *Audubon Representative*, R. HEATH; *Editor*, E. O. HÖHN; *Librarian*, G. BALL.

Mellwraith Ornithological Club, London, Ont.

Past President, DR. W. W. JUDD; *President*, H. A. U. MUNROE; *Vice-President*, DR. F. S. COOK; *Recording Secretary*, D. DOW; *Treasurer*, MISS M. MACPHERSON; *Corresponding Secretary*, MRS. M. E. LEAHY, 682 Huron St., London, Ont.; *Migration Secretary*, J. W. LEACH, 376 Platt's Lane, S.S. 3, London, Ont.

Natural History Society of Manitoba

President, DR. J. C. RITCHIE; *Treasurer*, HAROLD MASSOP; *General Secretary*, E. DOWTON, 47 Cunningham Ave., Winnipeg 8, Manitoba.

Nova Scotia Bird Society

President, C. R. K. ALLEN; *Vice-President*, DR. HARRISON F. LEWIS; *Secretary-Treasurer*, CAPT. T. F. T. MORLAND, c/o Nova Scotia Museum of Science, Spring Garden Road, Halifax, N.S.; *Editor*, DR. LLOYD B. MACPHERSON.

Provancher Society of Natural History of Canada

President, J. KENNEDY HILL; *First Vice-President*, FRANCOIS HAMEL; *Second Vice-President*, RONALD E. BLAIR; *Secretary-Treasurer*, GEORGES A. LECLERC, 628 Fraser St., Quebec, Que.

Province of Quebec Society for the Protection of Birds

President, C. C. SALT; *Vice-Presidents*, J. DELAFIELD, MISS R. B. BLANCHARD; *Treasurer*, MISS G. E. HIBBARD; *Secretary*, MISS RUTH S. ABBOTT, 164 Senneville Road, R.R. 1, Ste. Anne de Bellevue, Que.; *Librarian*, MRS. P. H. DU BOULAY.

Toronto Field Naturalists' Club

President, DR. WALTER TOVELL; *Vice-President*, FRED BODSWORTH; *Secretary-Treasurer*, MRS. HILTON ROBSON, 49 Craighurst Avenue, Toronto 12, Ont.

Vancouver Natural History Society

Honorary President, N. A. M. MACKENZIE; *Past President*, A. R. WOOTTON; *President*, J. J. PLOMMER; *Vice-President*, FRANK SANFORD; *Honorary Secretary*, J. Y. NEILD; *Recording Secretary*, MISS ETHEL FUGLER; *Program Secretary*, JOHN GARDNER; *Honorary Treasurer*, FRANK SANFORD; *Librarian*, MRS. S. F. BRADLEY; *Editor of Bulletin*, C. B. W. ROGERS.

ADVICE TO CONTRIBUTORS

Manuscripts

Manuscripts should be typewritten on one side of nontransparent paper measuring 8½ by 11 inches. Authors are requested to use at least one given name. All text matter, including quotations, footnotes, tables, literature references, and legends for figures should be double-spaced. Only those words meant to appear in italics should be underlined. Every sheet of the manuscript should be numbered.

Webster's New International Dictionary is the authority for spelling.

References are made by the author-date system. They should be listed alphabetically and typed at the end of the main body of text. For titles in reference matter, abbreviations follow the rules in the *International Code for the Abbreviation of Titles of Periodicals* and the *World List of Scientific Periodicals*.

Other abbreviations should be used sparingly. The better-known terms of measurement follow CSA Specification Z85-1943 *Abbreviations for Scientific and Engineering Terms* or the equivalent of the American Standards Association (Z10.1-1941).

Tables should be titled and numbered consecutively in arabic numerals. Tables and legends for the figures should be placed after the list of references. Each table and all the legends should be on separate pages.

Notes should bear the name of one author only

and references in notes should be incorporated directly in the text.

Illustrations

All figures, including each figure of the plates, should be numbered consecutively in arabic numerals. The author's name, title of the paper, and figure number should be written in the lower left corner of the sheet on which the illustration appears. The legend should not be incorporated in the figure.

Line drawings should be made with India ink on white drawing paper, blue tracing linen, or blue-lined co-ordinate paper. Co-ordinate lines that are to appear in the reproduction should be ruled in black ink. Descriptive matter should be lettered, not typewritten, and all parts of the drawing should permit easy legibility even if a reduction is made.

Photographs should have a glossy finish and show sharp contrasts. For reproduction as a complete plate they should be mounted without space between prints.

For large drawings and mounted photographs the ratio of height to width should conform to that of the journal page (4½ by 7½ inches) but the height should be adjusted to allow for the legend.

Reprints

Reprints, with or without covers, may be bought. The cost is given on the reprint order form which is attached to the galley proofs.

JOURNALS NEEDED

● Transactions of the Ottawa Field-Naturalists' Club

No. 1, 1880

● Ottawa Naturalist

Vol. 4, No. 6	September	1890
Vol. 7, No. 9	December	1893
Vol. 11, No. 10	January	1898
Vol. 11, No. 11	February	1898
Vol. 11, No. 12	March	1898
Vol. 12, No. 1	April	1898
Vol. 12, No. 4	July	1898
Vol. 12, No. 7 and 8	October-November	1898
Vol. 12, No. 9	June	1901
Vol. 15, No. 3	June	1901
Vol. 15, No. 4	July	1901
Vol. 15, No. 8	November	1901
Vol. 17 (marked in error 18) No. 12	March	1904
Vol. 18, No. 4	July	1904
Vol. 19, No. 10	January	1906
Vol. 20, No. 4	July	1906

● Canadian Field-Naturalist

Vol. 34, No. 8	November	1920
Vol. 36, No. 5	May	1922
Vol. 37, No. 3	March	1923
Vol. 39, No. 5	May	1925
Vol. 44, No. 9	December	1930
Vol. 45, No. 5	May	1931
Vol. 56, No. 6	September	1942

Your help in enabling us to supply back numbers will be greatly appreciated.

Send copies to:

MR. W. J. CODY, Ottawa Field-Naturalists' Club,
Science Service Building, Ottawa, Ontario

The CANADIAN FIELD-NATURALIST

Published by THE OTTAWA FIELD-NATURALISTS' CLUB, Ottawa, Ontario

Compliments to . . .

American Ornithologists' Union, 77th Stated Meeting
REGINA, SASKATCHEWAN, AUGUST 25 to 28, 1959

Articles

- Notes on the Birds of Southern Foxe Peninsula, Baffin Island,
Northwest Territories ANDREW H. MACPHERSON and IAN A. McLAREN 63
- Frits Johansen, 1882-1957 A. E. PORSILD and E. L. BOUSFIELD 82
- The Birds of Kleena Kleene, Chilcotin District, British Columbia, 1947-1958
W. ADRIAN B. PAUL 83
- Birds of the Mouth of the Anderson River and Liverpool Bay,
Northwest Territories E. OTTO HÖHN 93
- Observations on Birds of the Mackenzie King Estate, Kingsmere, Quebec
JOHN W. ARNOLD 115
- The Breeding Biology of the Greater Snow Goose on Bylot Island,
Northwest Territories LOUIS LEMIEUX 117

Notes

- A Case of Hellebore Poisoning J. EDWARD UNDERHILL 128
- The Pug Moth *Eupithecia stellata* Hlst. at The Pas, Manitoba
WALTER KRIVDA 129
- Bobolink Nesting at Penticton, British Columbia REGINALD N. ATKINSON 129
- A Poisonous Fungus in the Northwest Territories JOHN P. KELSALL 130
- Nematode Worms, *Diplotrriaena tricuspis* (Fedt.), from the Body Cavity of a Nashville
Warbler at London, Ontario WILLIAM W. JUDD 130
- An Occurrence of Lodgepole Pine in the Mackenzie District DONALD R. FLOOK 130
- A Joint Clutch of Barrow's Goldeneye and Bufflehead Eggs ANTHONY J. ERSKINE 131
- Bony Shells of Musk Turtles in Nest of Bald Eagle JAMES F. BENDELL 131

Reviews

- Ectoparasites of the Cottontail Rabbit in Lee County, Northern Illinois—The Birds of Alberta
—Changes in the Fauna of Ontario—The Ghost of North America—Tales From the
Vienna Woods—A Century of Biological Research—Conservation Papers 132

THE OTTAWA FIELD-NATURALISTS' CLUB

FOUNDED IN 1879

The objects of the club are to foster an acquaintance with and a love of nature, to encourage investigation and to publish the results of original research and observations in all branches of natural history. The patron is His Excellency, the Right Honorable Vincent Massey, C.H., Governor General of Canada. The club is a corporate member of the Federation of Ontario Naturalists.

MEMBERS OF COUNCIL

EDWARD L. BOUSFIELD, *President*, National Museum of Canada, Ottawa, Ontario

W. WINSTON MAIR, *First Vice-President*

DONALD R. BECKETT, *Second Vice-President*

JOHN M. GILLETT, *Treasurer*, Science Service Building, Ottawa, Ontario

A. W. FRANK BANFIELD, *Secretary*, National Museum of Canada, Ottawa, Ontario

I. L. CONNERS, C. FRANKTON, *Auditors*

MRS. JOHN W. ARNOLD, MISS ANNE BANNING, MISS CHARLOTTE DILL, MRS. JOHN HAWKSBRIDGE, MISS VIOLET HUMPHRIES, MISS PAULINE SNURE, THE REVEREND F. E. BANIM, MESSRS. J. W. ARNOLD, W. K. W. BALDWIN, D. R. BECKETT, B. BOIVIN, A. E. BOURGUIGNON, K. BOWLES, A. W. CAMERON, W. J. CODY, I. L. CONNERS, C. FRANKTON, R. FRITH, W. E. GODFREY, H. GROH, J. W. GROVES, R. A. HAMILTON, W. I. ILLMAN, H. LLOYD, C. R. PATTERSON, A. E. PORSILD, L. S. RUSSELL, D. B. O. SAVILE, H. J. SCOGGAN, G. W. SINCLAIR, V. E. F. SOLMAN, J. S. TENER.

THE CANADIAN FIELD-NATURALIST

Science Service Building, Ottawa, Ontario

ROBERT A. HAMILTON, *Editor*

W. J. CODY, *Business Manager*

Associate Editors: F. J. ALCOCK (Geology), JOHN W. ARNOLD (Entomology), W. A. BELL (Paleontology), J. SHERMAN BLEAKNEY (Herpetology), AUSTIN W. CAMERON (Mammalogy), WILLIAM G. DORE (Botany), J. R. DYMOND (Ichthyology), W. EARL GODFREY (Ornithology), A. G. HUNTSMAN (Marine Biology), A. LAROCQUE (Conchology).

The Canadian Field-Naturalist is published quarterly by the Ottawa Field-Naturalists' Club with the assistance of affiliated societies listed on the inside back cover. Manuscripts representing personal observations or the results of original research in any branch of natural history are invited. In the preparation of papers authors should consult the most recent issue and the information for contributors on the inside back cover. Advertising rates and prices of back numbers of this journal and its predecessors, *TRANSACTIONS OF THE OTTAWA FIELD-NATURALISTS' CLUB*, 1879-1886, and the *OTTAWA NATURALIST*, 1887-1919, are obtainable from the business manager.

MEMBERSHIP AND SUBSCRIPTION

The annual membership fee of \$4.00 covers subscription to the journal. Institutions, however, may subscribe at the same rate as that for membership. Single current numbers of regular issues are one dollar. Money orders should be made payable to the Ottawa Field-Naturalists' Club and sent to the treasurer. Notice of change of address should also be sent to the treasurer.

The Canadian Field-Naturalist

VOLUME 73

APRIL-JUNE 1959

NUMBER 2

NOTES ON THE BIRDS OF SOUTHERN FOXE PENINSULA BAFFIN ISLAND, NORTHWEST TERRITORIES

ANDREW H. MACPHERSON

Canadian Wildlife Service, Ottawa, Ontario

and

IAN A. McLAREN

Arctic Unit, Fisheries Research Board of Canada, Montreal, Quebec

THE following account of the birds of the southern coast of Foxe Peninsula is compiled chiefly from notes made in 1954 by I. A. McLaren and in 1955 by A. H. Macpherson while they were engaged in zoological research in the neighborhood of Cape Dorset, Northwest Territories. Notes relative to the area made by them in other field seasons are also included. McLaren, as an employee of the Fisheries Research Board of Canada, was studying the life history of the ringed seal and spent most of the summer at native camps between Cape Dorset and Amadjuak. Macpherson, who was working on the relationships of arctic gulls on a National Research Council (Wildlife Committee) grant, spent the early summer at a Kumlien's Gull colony about five miles southwest of Dorset settlement. He spent most of August journeying by boat between Amadjuak to the east and the Wildbird Islands (Bird Islands of Bray, 1943) to the northwest.

In 1954 McLaren was in the area between 2 March and 2 October. He was therefore able to make observations on many of the birds from their arrival to their departure. In 1955 Macpherson did not begin his observations until 9 May, when several species were already abundant. He left Dorset in mid-September.

We wish to acknowledge hospitality and help received from Miss M. Hines, Mr. and Mrs. Norman Ross, Mr. and Mrs. R. W. Peyton, Mr. and Mrs. J. Connington, Rev. Ernest Trinel, O.M.I., and Mr. D. Baird, all of Cape Dorset. We are very grateful to Mr. T. H. Manning for reading the manuscript and for useful suggestions and advice. Finally, we wish to thank Mrs. Macpherson for helping with typing and checking the manuscript, and for making the calculations, and Mrs. McLaren for typing the final draft.

The area with which this paper deals is the coastal strip of southwestern Foxe Peninsula (see Figure 1). Many land and shore birds were seen only occasionally or on migration, but sea birds abounded. Species not observed by the authors are mentioned only when this may contribute to knowledge of their status in this region. Reference to other papers is made only when essential. The reader is referred to Soper (1928, 1930 and 1946) for more comprehensive accounts of the birds of southern Baffin Island, for summaries

Mailing date of this number: 8 June 1959

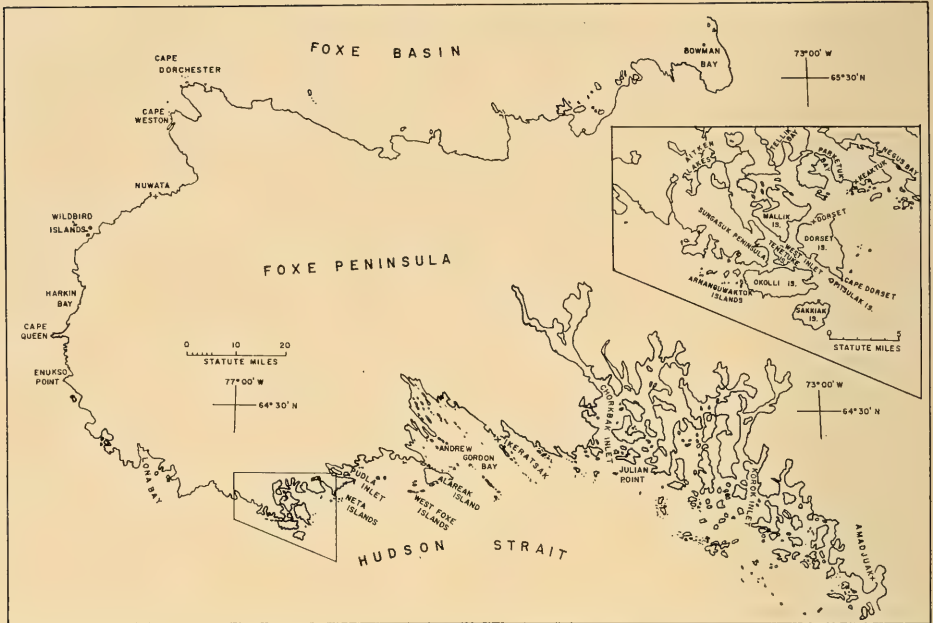


FIGURE 1. Map of southwestern Baffin Island, N.W.T.

of earlier work, descriptions of the area, and bibliographies. The names of those species whose occurrence in the region has not been proved are surrounded by square brackets. Local and Eskimo place names are included when considered useful, but are supplemented by the recognized name, if such exists. The Eskimo name of each species in use at Dorset is placed in brackets after the taxonomic name. For a guide to pronunciation see Thibert (1954), whose system of spelling Eskimo names is used here.

A collection of 233 birds was made by Macpherson for the National Museum of Canada. For an explanation of the methods of measurement used in this paper see Manning and others (1956). Color names, where italicized, correspond to those of the plates of Ridgway (1912).

Owing to the variable nature of the coastal terrain, the lack of any natural delimitation of the width of the coastal strip, and the restricted scope of present observations, the authors have not attempted to make a numerical estimate of the population of breeding birds in the region as a whole. Such an estimate has been made, however, for a small area southwest of Dorset Island (Figure 1, inset). This area, comprising the islands of Okolli, Tenetuke, Pitsulak, the "Arnanguwatok" group and the southeastern portion of "Sungasuk" Peninsula (names in quotation marks are local ones), has an area of about 20 square miles of land and about one-third square mile of lakes and ponds. No part of this area is more than one and a quarter miles from salt water. The shores are irregular and composed for the most part of polished bedrock. The land is broken by steep-sided valleys and ridges, the latter with beach terraces occupying irregu-

larities and frequently forming plateaus of rock detritus on the tops. Drainage has exerted little influence on the topography. Rock pools are abundant and shallow lakes occupy many parts of the valleys. There is very little low meadowland or marshland and vegetation generally is sparse. The tidal range is about 30 feet, and mud, sand and boulder flats are exposed at low tide in the bays. Rapid tidal currents and rips, which open early in the spring, are found in the straits.

On 11 June 1955, Macpherson camped by a small bay at the southeast corner of Sungasuk Peninsula. He spent about 130 hours walking on land and 70 hours rowing on the straits (these figures not including the time devoted specifically to the observation of gulls) between that date and 22 July. Practically the whole of the region described was covered once during the nesting season and much of it many times.

As can be seen from Table 1, 14 species nested in the area. For five of these an estimate is given of the number of pairs present, based on numbers seen during walks or on estimates made at breeding localities in the region; an absolute figure representing the number of pairs breeding in the area is given for the other nine. Most of the latter species did not occur in great numbers and were comparatively conspicuous.

The topography of the area described above, although not unique in the region, differs considerably from that of areas immediately adjacent. Dorset Island and Mallik Island (locally called Malitjuak, a reference to the wavelike shape of its western rim) have a more rugged topography and greater relief. As formidable chasms dissect the ridges, it was often necessary for us to use the hands as well as the feet in visiting higher ground. These islands, however, have a few fairly large stony flats which are flooded in the spring and are the

TABLE 1. NUMBERS OF PAIRS OF BIRDS NESTING IN SUBDIVISIONS OF THE AREA DESCRIBED (See text)

Species	Region					Total
	Okolli Island	Arnanguwatok Group	Sungasuk Peninsula	Tenetuke Island	Pitsulak Island	
Red-throated Loon	5		3	2		10
Canada Goose			1			1
Oldsquaw	6		9	2		17
Common Eider	50*	30*	20*	30*	10*	140*
Rock Ptarmigan	1		1			2
Semipalmated Plover	18*		15*			33*
Purple Sandpiper	4					4
Glaucous Gull		6	5	9	4	24
Kumlien's Gull			75			75
Herring Gull	6		4	1	2	13
Black Guillemot				20*	75*	95*
Water Pipit	10*		15*			25*
Lapland Longspur	1					1
Snow Bunting	30*	5*	20*	15*	5*	75*

*These numbers are estimated.

resort of numbers of migrating geese. The meadowland around the Hudson's Bay Company's establishment at Dorset is very attractive to migrating passerines. Longspurs and larks, elsewhere scarce, are frequent visitors there in spring and fall. Gulls of the three species occurring in the region are common scavengers in the harbor during the summer.

In contrast to the two areas described above, the area around Telik Bay and the Aitken Lakes, north of Mallik Island, is mild and green. The land is comparatively low and rolling, and buttes overlook large lakes and grassy slopes. The avifauna of this region is richer than that of the two previously described areas, and there is a greater proportion of land birds. Sakkiak Island, south of Okolli Island, is lower in relief than the latter and much of its terrain is well vegetated and contains marshes and shallow lakes. It probably has a larger Common Eider population than any other area of the same size within 15 miles of Dorset.

ANNOTATED LIST

COMMON LOON *Gavia immer* (Brünnich). (*Tudlik*) This species is uncommon in the coastal region. It nests in numbers on the larger inland lakes (Soper, 1928) and sparsely on the Aitken Lakes and other fair-sized 'fish-lakes' of the region. In 1954 it was probably nesting in small numbers on lakes at the head of Chorkbak Inlet.

Common Loons were first seen in 1954 on 6 June at the Aitken Lakes and in 1955 on 19 June at the floe-edge* near Cape Dorset. In both years, single birds and pairs were uncommon on the sea during June, and single birds were very infrequently seen thereafter in 1955. In 1954 young birds accompanied by adults were seen on the sea on 1 September, and many adults were seen near Korok Inlet on 9 and 10 September. Three Common Loons on Dorset harbor on 29 September were the last seen that year.

[**YELLOW-BILLED LOON** *Gavia adamsii* (Gray)] In 1954 McLaren was told by natives that they had occasionally seen Yellow-billed Loons and that one had been shot a few years before. A bird of this species was taken at Jens Munk Island in Foxe Basin in 1939 by G. W. Rowley (Bray, 1943) and Amagualik, an Eskimo living at Resolute with whom Macpherson worked in 1954, said that they were occasionally seen at Arctic Bay, and at Piling in Foxe Basin. Loons heard by Manning (Bray, 1943) in 1940 and by Manning and Macpherson on

31 August, 1949, at Piling, could have been of this species.

ARCTIC LOON *Gavia arctica pacifica* (Lawrence). (*Kadglulik*) Arctic Loons, like Common Loons, are scarce in the coastal region and are generally found breeding only on the larger lakes.

In 1954 they were first seen on 17 June, and in 1955 on 16 May. In 1955 a single bird was seen feeding on the strait west of Dorset on 7 and 15 June, and several times in July. It was believed to have a nest at the Aitken Lakes, or on a lake near Telik Bay where adults and two downies were seen on 28 July.

In 1954 Arctic Loons were apparently nesting at the head of Chorkbak Inlet. Six adults seen feeding in Pudla Inlet in 1955 were believed to have young inland.

RED-THROATED LOON *Gavia stellata* (Pontoppidan). (*Kaksaut*) This is by far the commonest loon in the area, but it was outnumbered by the other species of loons at the head of Chorkbak Inlet in late July, 1954. Red-throated Loons were first observed in 1954 on 5 June at the Aitken Lakes, where one was seen in a shore lead. Next day two were seen at the same place. In 1955 the species was first observed on 31 May at the floe-edge. None were seen on fresh water until 3 June, when a pair was observed on a small lake on the mainland north of Dorset.

On 13 June 1955, a pair was collected from a small rock pool, the female with an egg in the oviduct and two empty follicles. On 14 June a single bird and two pairs were seen on Okolli Island. From this date on,

*The term "floe-edge" is used in this paper to mean the edge of the land-fast ice. Though not a recognized term, it is a useful one, and universally employed by the white residents of the Canadian arctic.

Red-throated Loons were seen almost daily until 7 September. They were nesting on practically all lakes of 100 yards and more in width, as well as on many smaller ones, but only on a few of the larger lakes was there more than one pair. On 23 June, nine Red-throated Loons, probably with nests in the vicinity, were seen in the small strait between Okolli Island and the land to the north. Two nests with two eggs each were found on Okolli Island on 30 June and 2 July, and the presence of another nest on Tenetuke Island was inferred on 1 July. On 11 July a female was killed by the Eskimos; her two eggs, which contained downy chicks, measured 73×46 mm and 75×46 mm respectively. They were *raw umber* in color, finely speckled with *cream color*, and sparingly blotched with *fuscout-black*.

In 1955 the first downy was seen on 17 July on a lake on Tenetuke Island, and two partly fledged, full-grown young were collected on a small rock pool on Sakkiak Island on 16 August. In the same year the species was found breeding on most of the islands east of Dorset to Amadjuak and on many of the lakes of the west coast of the peninsula. Although young birds were seen at sea on 1 September 1954, a juvenile attended by parents was observed on 3 September on a pond southwest of Andrew Gordon Bay. It had recently eaten three Polar Cod (*Boreogadus saida*).

Macpherson was told by the natives that, throughout the summer, when one of a pair of Red-throated Loons is shot, the survivor is quickly joined by another bird. This was perhaps the case with the mate of a male shot on 14 June; she had apparently been joined by another bird within the next four days. Red-throated Loons can be induced to land on a lake (not on the sea) over which they are flying by a person emitting a continuous, high-pitched wail. The best results are obtained by breaking into a series of appalling shrieks as the bird wavers. The female taken by the Eskimos on 11 July was hunted in the following manner. Four Eskimos crept up to the pond on which the bird was incubating eggs. She slipped into the water, swam to one edge of the pond, emerged and started to take flight, at which the natives converged on the pool, screaming. This had the effect then, and whenever repeated, of causing her to flop back into the water. She was eventually killed by stoning, her attempts at flight frustrated (see also

Jenness, 1928, p. 146). Children, out seal-hunting with their parents, amused themselves by shouting sharply, thus causing Red-throated Loons flying over the boat to snap their legs apart.

Two adult males taken on 13 and 14 June weighed 1800 and 1890 gm respectively. Weights of five adult females taken between 13 June and 7 September were as follows: 1550 gm, 1750 gm, 1450 gm, 1760 gm, and 1675 gm (mean: 1637 gm). A downy male taken on 17 July weighed 210 gm, and a flightless young female taken 7 September, 1875 gm. The irides of all adults taken were *carmine*; those of a downy, although obscured by a cloudy cornea, *hazel*.

The natives occasionally eat Red-throated Loons. Some are taken accidentally in fish nets while others are shot or stoned. Mr. J. A. Houston (a Northern Service officer) said that the Dorset Eskimos consider young loons killed in early autumn a delicacy, but Macpherson found them rather tasteless.

FULMAR *Fulmarus glacialis minor* (Kjaerbølling). (*Kakodluk*) In 1954 McLaren saw two Fulmars on different dates in mid-July and three on 27 August, all off Cape Dorset. In 1955 Macpherson saw one off Alareak Island in early August and two on 1 September off Cape Dorset. The nearest reported breeding colony is in Cumberland Sound, east Baffin Island (Wynne-Edwards, 1952).

[WHISTLING SWAN *Olor columbianus* (Ord). (*Kudjuk*)] Soper (1946) obtained young Whistling Swans on 26 August 1928, near Nuwata, and thought he saw a flock at Cape Dorset (1928).

According to the natives they are seen occasionally at Dorset, but are commoner at Cape Dorchester. McLaren was told that pairs were seen near Dorset on 3 and 5 June 1954. Lt. Cmdr. J. P. Croal, R.C.N., observed a pair and a previous year's nest in July 1955, on the mainland opposite the Wildbird Islands (verbal communication). On 9 August 1949, a swan was seen by Macpherson on Putnam Island, about 40 miles southwest of Cape Dorset.

TODD'S CANADA GOOSE *Branta canadensis interior* Todd. (*Nerglek*) Todd's Canada Geese nest regularly on Foxe Peninsula, an area where their breeding grounds overlap with those of Hutchins' Goose, a smaller and more northern race. Reproductive isolation of the two forms is apparently complete, but little is known of their nesting-site pre-

ference, degree of association during nesting, or comparative breeding behavior.

In 1954, two were seen on 19 May near Korok Inlet, and thereafter pairs and small groups were commonly seen on the nearby islands. In the same year pairs and small groups were seen in early June at the Aitken Lakes. A pair was seen on a pond near Andrew Gordon Bay on 19 June, but none were noted near the coast during the rest of the summer. Several groups of three to 11 birds were seen near Korok Inlet in early September 1954.

proaches his type specimen in size) and with six Canada Geese, presumably *interior*, from Hudson and James Bays, Manitoba and Wisconsin, including a molting female from Weston Island and another from South Twin Island, the latter the darkest examined. Measurements of the sexed south Baffin Island birds are given in Table 2 and measurements of an unsexed Canada Goose from Markham Bay are as follows: straightened wing 425 mm, culmen 49 mm. They agree better with the ranges given by Delacour for *interior* (wing 410-549 mm,

TABLE 2. MEASUREMENTS OF CANADA GEESE FROM SOUTHERN BAFFIN ISLAND

Origin of Specimens	Males			Females		
	No.*	Straightened Wing	Culmen	No.	Straightened Wing	Culmen
Koukdjuak River	25005	(molted)	47.4	25007	(molted)	45.8
	25006	429	49.8	25008	(broken)	47.8
Cape Dorset	21014	431	49.4	21015	410	46.6
	21077	442	48.0	21078	418	49.0
Lake Harbour	24886	425	48.0	24994	437	50.0

*National Museum of Canada catalogue numbers.

In 1955 a few Canada Geese were taken by natives near the settlement on 15 and 17 May. Their numbers were swelled by later migrants until 28 May, when 20 were seen at the Aitken Lakes. On 1 June a nest containing two eggs was found at Pudla Inlet by Don Baird, the Hudson's Bay Company clerk. Two pairs, apparently nesting, were seen on 11 June, and a pair was disturbed from a sea-facing cliff on 13 June. Macpherson was told by an Eskimo that Canada Geese sometimes nest on cliffs in this region. On 17 June a nest with six eggs was found on a small grassy island in a pond, but it was deserted on 18 July. A group of six was seen east of Chorkbak Inlet on 9 August, and on 26 August a flock of 12 Canada and two flocks (each of eight birds) of Hutchins' Geese were seen feeding separately on a small pond opposite the Wildbird Islands.

Eleven Canada Geese from southern Baffin Island (five males, five females, one unsexed) in the National Museum collection have been examined. They were found to agree in color with Todd's (1938) description of *B. c. interior* (although none ap-

culmen 43-64 mm) than with those for *canadensis* (wing 450-550 mm, culmen 48-65 mm) (Delacour, 1954) and, with the color comparison, indicate uniformity in the Canada Goose population of southern Baffin Island, at least as far east as Lake Harbour. This is contrary to the suggestions of Soper (1946) and Delacour (1954).

HUTCHINS' GOOSE *Branta canadensis hutchinsii* (Richardson). Although Soper (1928) found Hutchins' Geese nesting on an offshore island near Cape Dorset and at the Aitken Lakes, they appear generally to nest further inland than do the Canada Geese, the reverse of the situation described by Sutton (1932) on Southampton Island. As this area is close to the northern limit of the larger race, the apparently ecological distinction in breeding grounds between Canada and Hutchins' Geese may be merely a geographical one, Canada Geese nesting on the southern fringe of the area, rather than being confined by habit to the coastal strip.

On 5 June 1954, McLaren found Hutchins' Geese associating with the migrating Blue and Snow Goose flocks. They were found

to separate out when a mixed flight was started from the ground, and tended to fly in unbroken lines within the Blue and Snow Goose V's. McLaren considered that in voice and behavior they resembled Blue and Snow Geese rather than Canada Geese. By 7 June Hutchins' Geese formed the bulk of many of the high-flying flocks and, by the 8th, outnumbered Snow and Blue Geese at the Aitken Lakes. In mid-June a few small groups were still flying north, some being seen at the head of Andrew Gordon Bay. In 1955 Macpherson first saw Hutchins' Geese on 14 May, when a pair and a single bird rested on the floe-edge near Cape Dorset for most of the day before flying inland. None were identified in the big Blue-Snow flocks flying in at the beginning of June.

On 31 July 1954, two broods, one of five and one of six well-feathered young, were seen at the head of Chorkbak Inlet, and on 25 August 1955, an adult and a brood of four young, almost ready to fly, were noted on a pond just north of Cape Queen. On 26 August 1955, two flocks of Hutchins' Geese, each of eight birds, and a flock of 12 Canada Geese were seen feeding on a small lake. When disturbed they took off together, but flew in discrete flocks in different directions. Eight Hutchins' Geese were seen on 5 September 1954, near Korok Inlet.

BRANT *Branta bernicla brota* (Müller). Brant are regular migrants on the southwest coast of Foxe Peninsula. The only definite breeding record is that of Cooch (1957) who noted two nests on the West Foxe Islands in 1956.

Brant were first observed in 1954 on 12 June, when large flocks were seen by McLaren flying and resting on the water at the floe-edge between Cape Dorset and Andrew Gordon Bay. They were present in about the same numbers on 22 June and 1 July, but were much scarcer on 5 July. He also saw one from the *Calanus* (Fisheries Research Board motor vessel) on 23 August 1953, near the West Foxe Islands. In 1955 the first Brant were seen on 8 June, when a flock of about 50 crossed Dorset harbor flying to the northeast. On 13 June, four flocks, totaling about 175 birds, were seen flying north five miles southwest of Dorset. The following day a flock of about 100 was seen in the same area. Except for a young bird shot by Eskimos in Parketuk Bay, four miles north of Dorset, on 9 August, this species was not observed again.

BLUE and LESSER SNOW GOOSE *Chen caerulescens caerulescens* (Linnaeus) and *Chen caerulescens hyperborea* (Pallas). (*Kangok*) We tentatively adopt the view that these forms are subspecifically distinct (Manning, 1942; Manning and others, 1956).

These birds nest in large numbers at Bowman Bay, just north of Foxe Peninsula. They occur in the Dorset region as abundant spring and fall migrants.

In 1954 a flight of about 20 Blue and Snow Geese was seen on 22 May in the islands southwest of Korok Inlet. Large flights were seen between this region and Dorset on 31 May and 1 June. They were very abundant at the Aitken Lakes on 5 and 6 June but less common by the 8th. About 40 Snow Geese were noted on 18 June, the last day on which small flocks were seen. The last bird of the spring was seen alone near Alareak Island on 28 June.

In 1954, near Korok Inlet, the fall migration occurred between 4 and 10 September; the largest numbers were seen on 6 September. The last flock seen was a small one at Dorset on 17 September.

In 1955 the first observation was on 30 May, when a flock of 10 Blue and two Snow Geese passed over the Aitken Lakes. On 31 May flocks totaling 62 Blue and 25 Snow Geese passed over, and on 1 June flocks were flying over Dorset at very short intervals. Of 550 geese seen on 2 June, 250 were Blue Geese and 300 Snow. On 3 June several large flocks and a number of small groups were seen. Of the latter, three were observed at close range. Together they contained 10 Blue and 10 Snow. Of 146 Geese in four flocks on 5 June, 123 were Blue and 23 Snow. Some landed near the settlement and a few were taken by Eskimos. Several flocks were seen on 7 June and one on the 15th. Blue and Snow Geese were not seen between 15 June and 25 August, when a flock of about 40 flew high down the coast near Enuako Point. The fall migration at Dorset occurred between 1 and 3 September, when geese were passing over regularly, but flying much higher than was usual in the previous spring. The last two flocks observed passed on 9 September.

Very few (perhaps 20) Blue and Snow Geese were taken in the fall by the Dorset Eskimos. This is apparently usual, as the geese are flying high and are quite wild.

PINTAIL *Anas acuta* Linnaeus. Although the Dorset Eskimos are not familiar with this species, three male and two female Pintails were seen on 8 June 1954, at the Aitken Lakes. There are apparently only two other observations from southwest Baffin Island: in July 1940, Manning (Bray, 1943) frequently saw two to five at a small lake near Koukdjuak River, Foxe Basin, and Soper (1946) took a specimen at Cape Alberta on the north side of Foxe Peninsula.

GREEN-WINGED TEAL *Anas carolinensis* Gmelin. On 5 June 1955, an unmated drake (wt., 270 gm; testis, 31×9 mm; no fat) was collected at the Aitken Lakes. Cooch (1957) also observed drakes of this species at the West Foxe Islands in 1955. None of the

from a small rock pool, but some had occupied nesting sites before this date, as on 4 June D. Baird saw several in lakes near Pudla Inlet. On 12 June, two pairs were seen on Okolli Island and thereafter pairs were commonly observed on land as well as on the sea.

A possible relation between weight and condition of gonads is shown in Table 3 (data from specimens collected).

On 5 July 1955, a single egg was found in a nest on a small point in a pond on Okolli Island. It measured 52.8×32 mm. (The average of 139 eggs in the U.S. National Museum [Bent, 1951] was 53×37 mm; the minimum small diameter, 35.5 mm). It was without markings, a little greener than *deep olive buff*. This nest, and possibly two more

TABLE 3. WEIGHTS OF OLDSQUAWS AND CONDITION OF GONADS

Males			Females		
Date (1955)	Weight	Condition of gonads	Date (1955)	Weight	Condition of gonads
May 31	860 gm	Testis: 25 mm	June 11	800 gm	Largest ova: 36, 34, 24 mm
June 7	760 gm	Testis: 33 mm	June 22	635 gm	Yolk in oviduct; 1 follicle
June 11	750 gm	Testis: 37 mm	July 5	625 gm	Yolk in oviduct; (34 mm) 2 follicles

Eskimos questioned remembered having seen one before and these appear to be the first Baffin Island records.

OLDSQUAW *Clangula hyemalis* (Linnaeus). (*Aggierk*) The first Oldsquaws seen in 1954 were five some distance off the floe-edge near Dorset on 29 April. A few pairs were seen at the Aitken Lakes in early June, although most Oldsquaws were still feeding on the sea and many hundreds were congregated at the floe-edge between Cape Dorset and Andrew Gordon Bay on 12 June. Between 17 and 19 June every lake at the head of Andrew Gordon Bay was occupied by courting pairs, and by 22 June the large flocks had vanished from the floe-edge.

In 1955 Oldsquaws were first observed on 13 May, when two ducks and two drakes were seen at the floe-edge. They remained there throughout the next day, swimming deep in the water with their heads low, occasionally diving, the males showing incipient courtship activity. Their numbers rapidly increased until about 7 June, when approximately 200 were assembled at the floe-edge. On 11 June a pair was collected

Oldsquaw nests, was but a few yards from two Common Eider nests on the same pond. In 1954 a nest with seven eggs was found on 25 July on Alareak Island. In 1955 their characteristic call, a regular tundra sound in early summer, was infrequent after 3 July, sounding ragged when heard and sometimes incomplete. On 8 July a flock of 45 birds of both sexes was seen in Parketuk Bay.

In 1954, near Korok Inlet, flocks of Oldsquaws were seen between 5 and 10 September, but the species was much less common than in the spring. In 1955, on 7 August, a last flock of 30 was observed on the sea, a few miles east of Dorset.

One of the three breeding Oldsquaw females collected (23 June) has a very worn tail and is presumably a yearling.

COMMON EIDER *Somateria mollissima borealis* (Brehm). (*Mitierk*, *mitivik*; male only: *amaulik*) The Common Eider is probably the most abundant breeding bird of the coastal region, nesting in large numbers on islands on the sea and in lakes, on rocky hillsides and even on cliffs, at least as far

north as Cape Queen; none were definitely identified between there and the Wildbird Islands. During the summers of 1955 and 1956 Mr. Graham Cooch was studying the species at the West Foxe Islands* from the standpoint of future utilization of the down.

In 1954 Common Eiders were not seen until 19 May, when there were pairs and small groups at the open tide rips among the islands west of Korok Inlet. They were commoner there by 25 May, although scarce in the morning and evening. McLaren thought they might be spending the nights at the floe-edge about 10 miles away. By 12 June they were as common as King Eiders, owing to the latter becoming scarcer and the former commoner. Many were seen on 12 June at

twice that number, were seen on the strait between Tenetuke Island and Sungasuk Peninsula. As the complex inlets and bays became clear of ice, Common Eiders became more evenly distributed and fewer were to be seen off the Cape and the straits. Tide rips opened inshore and fairly large numbers resorted to these; one such, north of Dorset and about one square mile in area, contained 150 Common Eiders on 3 June. On 7 June the number in the strait mentioned above had decreased to 200, but groups could be seen wherever there was open water, sitting for long periods on the ice-edge. On 12 June, four lone males were seen; perhaps they had mates incubating by this time. Two lone females were observed on 19 June at nesting-

TABLE 4. INCREASE OF CLUTCH SIZE IN COMMON EIDERS

Date (1955)	Number of nests seen	Number of eggs per nest										Average number of eggs per nest
		0	1	2	3	4	5	6	7	8		
June 25	3	2			1						1.0	
June 28	6	2	2			2					1.7	
July 1	7		1	3	2		1				2.6	
July 15	8					6	1			1	4.5	

the floe-edge between Dorset and Andrew Gordon Bay.

In 1955 the first Common Eiders seen were two groups of two males on 10 May. On 13 May a group of 29 males and six females was watched at the floe-edge near Cape Dorset. The drakes were actively pursuing the ducks, but the latter appeared uninterested. Both sexes were feeding on bottom organisms in water about seven meters deep and were seen to be using their wings under water. On 14 May more females were in evidence; of 250 Northern Eiders seen, about 65 percent were males. The females were following the males, in contrast to the behavior of birds seen the previous day, and many pairs had formed.

On 15 May an estimated 400 were seen in a patch of open water of about eight square miles off the south end of Dorset Island. After this date the water was choked with pack ice until 26 May and few Common Eiders were seen. On 30 May about 250, mostly paired, and on the 31st about

sites on Okolli Island and, on the same day, several appeared to have difficulty in rising from the sea in the motionless air; they were probably heavy with eggs.

The proportion of male to female Common Eiders seen in any particular place changes markedly throughout the season. In 1955 many males arrived at the floe-edge before their mates. As pair formation proceeded, males and females were found in increasingly similar numbers and, as the females began to incubate (Table 4) drakes outnumbered ducks on the sea and became rarer on lakes. The sexes were almost invariably seen together between 1 and 28 June, but on 2 July females outnumbered males on lakes by about eight to one. On 4 July single males were common at sea and on 6 July a flock of 30 males and three females was observed roosting on the shore. On 11 July, 120 Common Eiders were counted on the sea, about 85 percent of them males.

A few immature Common Eiders are probably found on the sea throughout the season. First year males were identified on 5, 13, and 28 July.

*The original name for these islands appears to be "W. Fox" Islands. They are called by Soper (1928) the "Fox" Islands and appear on his Common Eider specimen labels as "Wm. Fox" Islands.

Downies were first observed in 1955 on 28 July, when a brood of five was seen at one of the lakes at the head of Tellik Bay and another of four in the strait near Tene-tuke Island. On 4 August, two nests were found, one containing four eggs and the other five ducklings; another brood was noted in Pudla Inlet. On 5 August about 60 ducks were flying about in the Inlet and were believed to be nesting on the islands there. On the same day three ducks with 12 downies were seen at Ikeratsak (a local name) and ducks with their broods were

gm in weight (mean 1871 gm), and 12 ducks collected between 23 June and 20 July, between 1475 and 2100 gm (mean 1756 gm). Weight apparently remained fairly constant during the breeding season.

The feet and 'shield' of a drake taken on 21 May were *honey yellow*. The toes of three ducks taken on 17 July were colored *dark olive buff* (1) and *buffy citrine* (2).

A large series (27 males, 31 females) of adult eiders, including those collected in 1955, in the National Museum collection from Cape Dorset and Andrew Gordon Bay,

TABLE 5. MEASUREMENTS OF COMMON EIDERS FROM SOUTHWEST BAFFIN ISLAND

Measurement	No.	Extremes	Mean	S.E.	S.D.	S.E.	C.V.	S.E.
MALES								
Culmen	25	46.0- 53.9	50.50	.402	2.0080	.2839	3.9761	.5623
Length of frontal process	26	15.2- 21.8	19.41	.321	1.6352	.2268	8.4260	1.1684
Width of frontal process*	27	5.0 - 8.4	6.40	.158	0.8183	.1114	12.7933	.1741
Wing chord	25	263 -296	278	1.66	8.324	1.18	3.01	.426
FEMALES								
Culmen	30	44.0- 51.5	47.90	.390	2.1347	.2756	4.4563	.5753
Length of frontal process	31	13.7- 20.1	16.93	.279	1.5515	.1970	9.1641	1.1638
Width of frontal process*	31	3.7- 6.0	4.81	.988	0.5502	.6987	11.4318	1.4518
Wing chord	31	251 -280	267.7	1.28	7.1344	.906	2.665	.374

*The width of the frontal process can be taken in two different ways, particularly in the females. It is here measured as the exposed width.

seen every few miles among the islands between Chorkbak Inlet and Amadjuak. Only four drakes were seen between 9 and 12 August. These included one with a female and one that was molting and flightless. On 14 August about 20 Common Eiders (probably all drakes) were found in a flightless condition near the Neta Islands.

In 1954, between 1 and 12 September, McLaren observed large rafts of flightless young and adults among the islands east of Chorkbak Inlet, especially at the southern fringe. A few remained, at least until 2 October, at Dorset harbor. In the fall of 1955 Macpherson saw no concentrations near Dorset, although, until at least mid-September, groups of young and females were quite common among the islands between Dorset and the West Foxe Islands.

Eight drakes collected between 21 May and 2 July ranged between 1775 and 2100

gm in weight (mean 1871 gm), and 12 ducks collected between 23 June and 20 July, between 1475 and 2100 gm (mean 1756 gm). Weight apparently remained fairly constant during the breeding season. The feet and 'shield' of a drake taken on 21 May were *honey yellow*. The toes of three ducks taken on 17 July were colored *dark olive buff* (1) and *buffy citrine* (2). A large series (27 males, 31 females) of adult eiders, including those collected in 1955, in the National Museum collection from Cape Dorset and Andrew Gordon Bay,

are all referable to *S. m. borealis*. Two downies collected from a single brood near Dorset on 28 July 1955, although darker, particularly on the face and rump, than six *sedentaria* downies (of three broods) from James Bay, are paler, particularly on the throat, flanks and belly, than five downies from the Aitken lakes collected by Soper on 18 and 20 July 1926. Measurements of the adult birds are given in Table 5.

In 1954, on 25 April, McLaren observed thousands, almost all of which were males,

at the floe-edge near Cape Dorset. On 29 April adult males were still in the majority, although females had become more abundant and some courtship activity was observed. A large flock of King Eiders, mostly males, spent the morning of 6 May on the ice of one of the Aitken Lakes. In late May a few were noted in the open tide rips among the islands near Korok Inlet, where they were outnumbered by Common Eiders. On 12 June, at the floe-edge between Cape Dorset and Andrew Gordon Bay, they were found almost as commonly as the latter species; unlike the flocks seen in April, dark birds, probably immature males, predominated. In early July several flocks, also containing many immature males, were noted, but King Eiders were scarce from late July to early September, when large flocks, chiefly of young, and eclipsed but not flightless males, were seen east of Chorkbak Inlet.

On 10 May, when observation was first begun in 1955, very little open water was visible and only six birds (three males and three females) were seen. On 11 May, 20, and next day about 600, were seen in the distance flying over loose pack. On 13 May, in an area not exceeding a quarter square mile, about 800 birds, ducks and drakes in approximately equal numbers were sleeping in the water and on the edge of the ice. The greatest number was seen on 15 May, when approximately 1500 were feeding in about eight square miles of open water off Cape Dorset. By the beginning of June the large flocks were greatly reduced, but until the 12th a few were still feeding at the floe-edge.

Clam and whelk shells littered the ice upon which King Eiders roosted, and a drake was collected in the act of swallowing a 75-mm truncate soft-shelled clam (*Mya truncata*). Dives in seven meters of water averaged 45 seconds duration and were repeated at intervals of three to 10 minutes. Many King Eiders were seen "dabbling," perhaps for plankton.

Pairs and small groups in courtship activity were observed on ponds at the head of Andrew Gordon Bay between 17 and 19 June, 1954, and on 3 June 1955, a pair was swimming on an inland pond near Dorset. In the latter year pairs were regularly seen near Dorset until 19 June. Five drakes were seen in a group on 24 June and 6 on 19 July. A group of three drakes, two adult and one immature, and two ducks was observed near Dorset on 27 June, and one pair on 17 July.

The presence of a few breeding King Eiders on the southwest coast is suggested by these observations.

On 26 August 1955, 10 King Eider ducks, some with young, were seen among the rocky islands north of Cape Queen. This cape appears to be the southern limit of their main breeding area. Further north, at least as far as the Wildbird Islands, they displace the Common Eider. Macpherson was informed by Eskimos that a lake a short distance inland from Harkin Bay, and about 50 miles northwest of Cape Dorset, is occupied by large numbers of King Eiders during the breeding season.

A drake with incomplete white specula (testis: 11 mm), taken on 13 May, weighed 1800 gm. The colors of the soft parts were: 'shield' and tarsi, *deep chrome*; base of cere, *jasper red* with *deep chrome* molting.

[WHITE-WINGED SCOTER *Melanitta deglandi* (Bonaparte).] Macpherson obtained a good view of a White-winged Scoter in flight on 2 August 1955, near the Neta Islands. Cooch (1957) saw an adult male at the West Foxe Islands on 19 June 1955, and on 20 August a flock of 130 molting adults east of Andrew Gordon Bay. The only previous record for Hudson Strait appears to be that of Comeau (Manning, 1949) who saw both Surf Scoters and White-winged Scoters there, and the nearest definite record that of Manning (1949) who collected both species between Inner Island and McCormack Island on 2 August, 1946.

RED-BREASTED MERGANSER *Mergus serrator serrator* Linnaeus. (Paierk) Red-breasted Mergansers breed in small numbers on the larger 'fish lakes' of the region.

In 1954, in the open tide rips west of Korok Inlet, two were seen on 27 May and six males and a female on the 29th. Four were observed on 5 June and two females with nine downies on 21 August, all at the Aitken lakes.

In 1955 one Red-breasted Merganser was seen on 14 May, feeding with Northern Eiders at the floe-edge near Cape Dorset, and thereafter pairs and single birds were seen throughout the summer at intervals of about one week.

ROUGH-LEGGED HAWK *Buteo lagopus s. johannis* (Gmelin). (*Krimuaiyoak*) The abundance of this species, like that of the Snowy Owl, depends greatly on the abundance of lemmings. In 1954 lemmings were found in fair numbers, but in 1955 they were very scarce, particularly *Dicrostonyx*. In

1954 Rough-legged Hawks bred in the region, and in 1955 apparently did not.

In 1954 on 15 May a light-phased individual was seen near Chorkbak Inlet, making an unsuccessful attack on a ptarmigan. Another light-phased bird was noted in late May near Korok Inlet. Two pairs, both dark-phased, occupied cliffs one and a half miles apart near the Aitken Lakes in early June. The nests were perhaps too close for comfort, as a bird from one cliff engaged the other pair on 8 June. Another two birds, possibly paired, were seen about three miles west of the Aitken Lakes, and several were seen thereafter, including two at the head of Negus Bay and a light-phased bird at Dorset on 16 September.

In 1955 a Rough-legged Hawk was seen on 13 May near Dorset, wheeling over the frozen sea. On 15 May a dark-phased bird was put up from a hillside on Dorset Island and another, also dark-phased, was observed on 17 May soaring above West Inlet. Two light-phased birds were seen separately near Aitken Lakes on 28 May and another was wheeling above the ice on West Inlet on 30 May. This was the last Rough-legged Hawk seen until 28 July, when a single dark-phased bird was noted at Tellik Bay.

All told, more than 11 Rough-legged Hawks were seen in the summer of 1954 and only seven in 1955. Of the 13 whose color phase was noted, seven, or about half, were dark-phased. There are no specimens of dark-phased Rough-legged Hawks from the Canadian Barren Grounds in the National Museum of Canada and no previous records have come to our attention (Manning and others, 1956). Caution must be exercised, however, in accepting a sight record of color phase in this species, particularly since Cade (1955) has shown a gradation in color between the two extremes. The birds described as dark-phased in the present account were undoubtedly darker than those described as light-phased. The question of how dark they were cannot be satisfactorily answered without specimens for comparison.

GYRFALCON *Falco rusticolus obsoletus* Gmelin. (*Kidgavik*) Gyrfalcons are not common nesting birds in the region, although the following records indicate the presence of three nesting sites within four miles of Dorset settlement. All those observed were light-phased.

In 1954 a single fully-fledged young Gyrfalcon was seen standing on a cliff on

the southeast side of Dorset Island on 16 August. It made several short flights but was still being tended by its parents.

In 1955 a pair had a nest on a cliff at Parketuk Bay and the female was collected on 26 May. On the 27th a pair was found nesting on a cliff on West Inlet. The birds were observed again on 30 May, but the nest was deserted when examined two weeks later. The disappearance of the birds apparently coincided with the occupation of the cliff by Kumlien's and Glaucous Gulls. Whether the two events are related is unknown, but the Gyrfalcons could not have completed nesting by this date.

The Parketuk Bay nesting site had been occupied for many years. Detritus in a rock-slide under the nest included fragments of rotten wood, seal bones, caribou antlers and white whale vertebrae.

The female collected on 26 May weighed 1700 gm, and had a brood patch and an enlarged oviduct; the remaining ova were being resorbed. The base of the cere was rather paler than *pale russian blue*.

PEREGRINE FALCON *Falco peregrinus anatum* Bonaparte. (*Kidgaviardjuk*) Peregrine Falcons were more common in the region in 1954 and 1955 than Soper (1946) found them.

In 1954 a single bird was seen on 25 May, stooping at Snow Buntings. Breeding pairs were observed at the Aitken Lakes and Negus Bay and, from young and adults seen flying in late August, another pair is inferred to have bred on Dorset Island. A bird at the Aitken Lakes was seen stooping at downy mergansers on 21 August and large young were seen at the nest in Negus Bay on 13 August. Peregrines were last seen on 3 September, when two were observed 'mobbing' a sitting Snowy Owl.

In 1955, four pairs occupied cliffs within six miles of Dorset in late May and early June, one at the Aitken Lakes, one at West Inlet, and two on Dorset Island—one near the Cape and the other a mile west of the settlement. Of two sites visited later in the season, one had been deserted. Other Peregrine Falcons seen in 1955 were a male on Okelli Island on 17 July, a pair with two nestlings at Pudla Inlet on 4 August, a single seen at the West Foxe Islands on the 5th, a pair guarding an empty nest at Ikeratsak on the 6th and, on 21 August, a male defending a cliff 15 miles west of Dorset.

A fairly fat female collected on 4 August weighed 1080 gm. Her ovary showed four

empty follicles. Her two chicks, one a male, the other probably a female, weighed 575 and 585 gm respectively. They were covered with white down and had short feather sheathes on the wings and tail; their crops contained the remains of passerine birds.

ROCK PTARMIGAN *Lagopus mutus rupestris* (Gmelin). (*Akridgek*) In 1954 McLaren was told by natives that a few Rock Ptarmigan winter on Foxe Peninsula, and he found tracks and droppings near Dorset settlement on 6 March. The first seen, however, were four on 11 May. On a trip along the floe-edge between Dorset and Ikeratsak on 13 May, 11 were seen in four groups moving northeast toward the land. A large number seen in the possession of Ikeratsak Eskimos on the same date had pronounced wattles and were perhaps all males; no female Rock Ptarmigan were definitely identified for another week. In late May they were subsisting largely on crowberry (*Empetrum*), which remained exposed on the wind-blown hilltops. During most of May a northward movement of Rock Ptarmigan occurred in the islands east of Chorkbak Inlet, but probably all those seen after 28 May were residents. A cock, uttering his belchlike challenge, flew violently and repeatedly against McLaren's tent on the night of 8 June.

Several broods of weakly flying young were seen at the head of Chorkbak Inlet between 29 and 31 July and a flock of 35 birds was noted on Dorset Island on 18 September.

Rock Ptarmigan were scarce at Dorset in the spring of 1955, the consensus of local opinion being that the migrating flocks had landed farther west. Between 14 and 20 May a pair and two single males were seen within five miles of Dorset. On 3 June a mated hen had much summer feathering showing and on the 14th a cock was observed with a few dark feathers on the head and neck. A family of nine, including the female parent, and perhaps the male, was seen at Pudla Inlet on 5 August, feeding in a grassy marsh. On 22 August a female with two young was seen on a five-mile walk near Lona Bay and on the 28th a family of 12, including a cock and a hen, was seen on a 10-mile walk near Enuks Point.

SEMI-PALMATED PLOVER *Charadrius semipalmatus* Bonaparte. (*Kodlikodliak*) Semipalmated Plovers are common breeding birds of the coastal region. In 1954 a few were seen on 5 June at the Aitken Lakes. In late July breeding Semipalmated Plovers

were the commonest of the small birds on Alareak Island and a nest with four eggs was seen there on 23 July. On the 26th downy young were noted at the head of Chorkbak Inlet, where Semipalmated Plovers, although plentiful, were outnumbered by White-rumped and Semipalmated Sandpipers.

In 1955, four were seen near Dorset in nine hours of walking on 2 June and 20, mostly in pairs, on a 10-hour walk the next day. One of these pairs was in full courtship activity. After this date the species was noted on almost every walk. The first distraction (broken-wing) display was observed on 11 June. At this time they are most frequently seen at the edges of small ponds, on the shore, and near brooks running through grassy tussocks. Three pairs seen on the 12th were defensive, although not displaying, but after that date frantic parents, whistling plaintively, were a common sight.

Distraction display was usually exhibited by only one parent, but on 29 June, after one had been fluttering on the ground for about five minutes, the other made similar movements, spreading the tail, crouching, erecting the feathers of the back, and vibrating half-spread wings. A nest with four eggs was found on 27 June and, on 2 and 4 July, three more full clutches were found. An egg collected on 5 July, in color between *olive buff* and *velvet green*, with black speckling, measured 33×24 mm. All nests found were deserted between 13 and 17 July and, on 26 July, two pairs were seen with one and two chicks respectively. All the chicks could fly, at least for a few feet. A pair with a brood of four full-grown young was seen on 8 August.

AMERICAN GOLDEN PLOVER *Pluvialis dominica dominica* (Müller). Even in migration, Golden Plovers are rarely seen in the coastal region, although they nest in small numbers around Nettilling Lake (Hantzsch, 1914, in Soper, 1928). In 1954 a male was taken by Eskimos on 15 June near Andrew Gordon Bay, and in 1955, between 1 and 3 June, D. Baird saw many at Pudla Inlet. On 16 August, 1955, a large plover, believed to be of this species, was observed flying over Sakkiak Island. Cooch (1957) observed this species at the West Foxe Islands in 1955 and 1956.

BLACK-BELLIED PLOVER *Squatarola squatarola* (Linnaeus). In 1954 McLaren observed single flying birds of this species on 5 and 6 June at the Aitken Lakes. On 12 June one

was seen in summer plumage near Andrew Gordon Bay, and on 18 June a group of three was observed at the head of the Bay, two of them in winter plumage. He saw another on 5 September in the same neighborhood. No Black-bellied Plovers were observed in 1955. Other records for Foxe Peninsula are those of Soper (1928, 1946), Manning (Bray 1943), and Cooch (1957).

RUDDY TURNSTONE *Arenaria interpres morinella* (Linnaeus). (*Anaktuyok*) In 1954 McLaren saw six Ruddy Turnstones near Dorset on 10 June and, on the 12th, several groups of 25 or more between Cape Dorset and Andrew Gordon Bay. Several were recorded in the spring of 1955 and 1956 at the West Foxe Islands by Cooch (1957). Turnstones breed on the north coast of the peninsula (Soper, 1946) and at Taverner Bay (Bray, 1943).

PURPLE SANDPIPER *Erolia maritima* (Brünnich). (*Sigdjariak*) Purple Sandpipers nest in small numbers along the south coast and perhaps more abundantly on the west coast of Foxe Peninsula. They are the first shore birds to arrive in the spring.

In 1954 they were first observed on 28 May, when seven were seen on exposed shores at tide rips among the islands west of Korok Inlet. On the 29th, 13 were seen in the same area. A few were seen on islands in the mouth of Andrew Gordon Bay on 12 June and a pair, believed nesting, was noted on Alareak Island on 25 July.

On 21 May 1955, a sandpiper, probably of this species, was seen at the floe-edge near Cape Dorset. Purple Sandpipers were first definitely identified on 3 June when 10 were seen on two miles of bare, rocky shore; on this date many were seen by D. Baird at Pudla Inlet. On the 11th one was observed uttering loud piping whistles and showing distraction display. Between 12 June and 13 July a few were seen on Okolli Island, of which the western third, about three square miles in area, was believed occupied by three nesting pairs. On 4 August an island in Pudla Inlet of about the same area was believed to be occupied by the same number of pairs. Judging from the small numbers seen elsewhere, however, the total population of Purple Sandpipers along the southern coast was distinctly smaller than the figures above indicate. On 8 August a group of five, including some young birds, was seen on tidal flats a few miles west of Chorkbak Inlet and on the 11th, two family groups were seen

flying among the islands 15 miles west of Amadjuak. At all the places where landings were made on the west coast of Foxe Peninsula, pairs or family groups were observed. On 26 August, a flock of 30 was seen on an offshore island north of Cape Queen, not far from the Wildbird Islands where Manning (Bray, 1943) believed they nested.

WHITE-RUMPED SANDPIPER *Erolia fuscicollis* (Vieillot). (*Livilivilak*) White-rumped Sandpipers nest only in a few favored localities.

In 1954 a few were seen on 5 and 6 June at the Aitken Lakes. Hundreds were seen on 12 June on islands at the mouth of Andrew Gordon Bay. Some were apparently nesting at Alareak Island on 25 July and, between 29 and 31 July, at the head of Chorkbak Inlet, where two fully feathered young were seen, they were the commonest resident shore birds. In 1955, the only White-rumped Sandpipers observed were a flock of 16 on an offshore island north of Cape Queen on 26 August. The species was recorded in migration at the West Foxe islands in 1955 and 1956 by Cooch (1957).

BAIRD'S SANDPIPER *Erolia bairdii* (Coues). This species was observed on spring migration at the West Foxe Islands in 1955 and 1956 by Cooch (1957).

LEAST SANDPIPER *Erolia minutilla* (Vieillot). Cooch (1957) recorded this species on spring and fall migration at the West Foxe Islands in 1955 and 1956.

DUNLIN *Erolia alpina* (Linnaeus). Dunlins were observed at the West Foxe Islands in the spring of 1956 by Cooch (1957).

SEMIPALMATED SANDPIPER *Ereunetes pusillus subsp.* (*Livilivilak*) On 10 June 1954, a few Semipalmated Sandpipers were noted on islands at the mouth of Andrew Gordon Bay, and they were more common on the 12th. A few residents were observed at the head of Chorkbak Inlet between 29 and 31 July. A pair was seen in late August on Dorset Island, and a large flight on 5 September at the mouth of Andrew Gordon Bay. Cooch (1957) found this species breeding on the West Foxe Islands in 1955 and 1956.

RED PHALAROPE *Phalaropus fulicarius* (Linnaeus). (*Saarkrak*) Red Phalaropes do not breed in the region, perhaps owing to the dearth of flat land. Manning (Bray, 1943) considered them the commonest breeding bird on the flat land north of Taverner Bay. Soper (1946) found them breeding abun-

dantly in northern Foxe Peninsula and remarks on their rarity on migration at the southern coast. Cooch (1957), however, observed many Red Phalaropes in migration at the West Foxe Islands in 1955 and 1956. In 1954 two large flocks of about 200 and 250 birds were seen on 12 June at the floe-edge south of Andrew Gordon Bay. On 1 July 1955, a female was collected on a small inland pool five miles west of Dorset (largest ovum 2.5 mm; little fat).

NORTHERN PHALAROPE *Lobipes lobatus* (Linnaeus). On 29 August 1955, three flocks totaling about 60 birds were seen at close range on the sea near Lona Bay. Manning (Bray, 1943) took a total of three specimens in 1939 and 1940 at Taverner Bay and a little south of it, and Soper (1946) observed two solitary males at Camp Kungovik (Bowman Bay) in late June 1929.

POMARINE JAEGER *Stercorarius pomarinus* (Temminck). (*Isungak*) On 12 June 1954, a Pomarine Jaeger was seen off the floe-edge near Dorset and another on 22 July 1955, about two miles southeast of Cape Dorset. Manning (Bray, 1943) saw this species between Koukdjuak River and Taverner Bay, "where they almost certainly breed."

PARASITIC JAEGER *Stercorarius parasiticus* (Linnaeus). (*Isungak*) On 1 June 1954, a Parasitic Jaeger was seen near Dorset and, on the 12th, three were observed at the floe-edge. Several pairs were seen on 30 July at the head of Chorkbak Inlet, one of which behaved as though it had young in the vicinity. On 13 and 14 August, 1955, single birds of this species were observed near Alareak Island and Ikeratsak. On 25 August, four were seen at sea between Lona Bay and Cape Queen and, on 7 September, six were seen flying more or less together three miles west of the West Foxe Islands.

LONG-TAILED JAEGER *Stercorarius longicaudus* Vieillot. In 1954 McLaren saw several pairs of Long-tailed Jaegers in late July at the head of Chorkbak Inlet. They were apparently resident, but in smaller numbers than Parasitic Jaegers. On 12 June and 16 July, one and two respectively were seen at sea. Cooch (1957) recorded a small number in the vicinity of the West Foxe Islands in 1955 and 1956.

Long-tailed Jaegers breed near Camp Kungovik (Bowman Bay) (Soper, 1946) and between Koukdjuak River and Taverner Bay (Bray, 1943).

GLAUCCUS GULL *Larus hyperboreus hyperboreus* Gunnerus. (*Naujavik*; immature: *nukapiluk*)

KUMLIEN'S GULL *Larus glaucoides kumlieni* Brewster. (*Naujak*)

HERRING GULL *Larus argentatus smithsonianus* Coues. (*Tesselingmiutak*, *nubugialik*)

These three species are regular and common breeding birds of the coastal region. A study of their relationships to other arctic gulls will be published later (see Macpherson, 1955, for a summary of field data).

BLACK-LEGGED KITTIWAKE *Rissa tridactyla tridactyla* (Linnaeus). (*Naujardlugak*) On 16 July 1954, McLaren observed two Kittiwakes in the offshore pack. Although the species is commonly seen on the east Baffin coast, it is very rare on Foxe Peninsula. Soper (1946) saw one at Cape Weston, northwest Foxe Peninsula, in 1928.

SABINE'S GULL *Xema sabini sabini* (Sabine). (*Tirratirrak*). On 12 June 1954, two Sabine's Gulls were seen at the floe-edge between Cape Dorset and Andrew Gordon Bay. They were said by Putuguk, a native of the region, to breed inland on Foxe Peninsula. They were found by Soper (1946) and Manning (Bray, 1943) nesting at Bowman Bay and Taverner Bay respectively.

ARCTIC TERN *Sterna paradisaea* Pontoppidan. (*Imerkotailak*) Arctic Terns breed only in a few localities on the Foxe Peninsula coast. They are apparently commoner north of Cape Queen.

On 12 June 1954, a few Arctic Terns were seen at the floe-edge south of Andrew Gordon Bay. Several were seen in late July around the lakes at the head of Chorkbak Inlet and were believed nesting on low islets. In 1955 Macpherson was told by Eskimos that the species nests on a group of islets six miles south of Julian Point, but the site was not visited, and terns were not met with until 26 August, when 200 were seen feeding at tide rips north of Cape Queen. Distribution as observed in 1955 is therefore similar to that described by Soper (1946). Two adult males and one juvenile of each sex were collected and the following notes made on the color of their soft parts.

Adults: Tarsi and ceres, *nopal red*.

Male F199: Tip of cere and border of nostril, black.

Male F200: Tip of cere, faintly blackish; no black border on nostril.

Juveniles:

Female F201: Base of mandible, between *scarlet* and *peach red*. Upper border of nostril black. Cere, and mandible distal to gonys, shaded blackish. Tarsi, *salmon orange*.

Male F202: Base of mandible, *salmon orange*; otherwise bill similar to F201. Tarsi, *capucine orange*.

Their gizzards contained crustaceans, particularly amphipods.

THICK-BILLED MURRE *Uria lomvia lomvia* (Linnaeus). (*Akpak*) In some years murrees abound at the floe-edge near Dorset in the spring and a few remain throughout the summer. The nearest colony is at Digges Sound, in northwestern Ungava (Manning, 1949).

In 1954 several groups were seen at the floe-edge on 29 April. They were not numerous on 11 May and none were seen at the floe-edge between Cape Dorset and Ikeratsak on 12 June, nor on 1 July in in-shore waters. On 16 July, however, they were fairly common offshore, particularly amongst the ice.

In 1955, on 10 May, about 1500 were feeding and flying in closely knit flocks off the floe-edge near Cape Dorset and about 2000 were seen in the same place on the 15th. They became less numerous after the 16th and by the end of May were rarely observed.

On 11 May about 2 percent of the murrees seen were in winter plumage and the rest in complete breeding plumage. Of the former, an immature female (ovary granular), and of the latter, an adult male (testis 20×6 mm) were collected. All of the 300 seen on 14 May were apparently in breeding plumage, but of 200 seen on the 16th, 20 percent had a few white feathers on the neck. If lateness of molt is an indication of immaturity, as appears likely (Salomonsen, 1944), the above observations suggests a differential movement of adult and nonbreeding birds.

On 7 July, two pairs of Brünnich's Murrees were seen at the entrance to Parketuk Bay. One of these pairs was collected and proved to be immature males. On 2 August small flocks of flying murrees, totaling 30, were seen at sea off the Neta Islands. On 1 September, eight groups of four were noted a few miles off Cape Dorset. Usually, if not invariably, these groups consisted of two adults and two fledgling flightless young. Two adults collected were both males.

Of 19 Brünnich's Murrees now in the National Museum, taken on 8 August 1949, at Digges Islands, Hudson Strait, only one (female, largest ovum: 3 mm) has white feathers on the black plumage of the throat, and four from Ungava Bay and Cape Wolstenholme taken between 14 and 21 July show no white feathering. These specimens were taken near breeding colonies, where immature birds would be expected to form a very small proportion of the murrees present. Of a total of 14 murrees from the Dorset region, only three were taken during the months of June, July and August—a female on 19 June 1926, and two males on 1 July 1955. The two males show heavy white flecking on the throat, and undeveloped testes. Salomonsen (1944) says of *Uria aalge* that "sometimes 2nd year birds keep a good deal of white feathers on throat in the summer-dress, as do the one year old birds," and "probably *U. aalge* never breeds in the second summer." The same is probably true of the present species, in which some immatures spend the summer in the general neighborhood of the breeding colonies.

There appears to be a considerable difference between the numbers seen at the Dorset floe-edge in 1954 and in 1955. In 1955 murrees apparently occurred there in much larger numbers than in 1954 and in 1928-29 (Soper, 1946). It is probably that the locations of spring concentrations in Hudson Strait are caused largely by ice conditions, the murrees resorting in numbers to the areas of open water nearest their breeding colonies.

In 1956 Cooch (1957) collected five murrees which had been banded as nestlings near Cape Wolstenholme the previous year.

Weights of murrees were recorded as follows:

Males:

Adult: 11-16 May (2) 875 gm, 850 gm.
1 Sept. (2) 1100 gm, 1010 gm.

Immature: 7 July (2) 1045 gm, 1020 gm.

Females:

Adult: 11-16 May (2) 935 gm, 915 gm.
Juvenile: 1 Sept. (1) 500 gm.

BLACK GUILLEMOT *Cepphus grylle ultimus* Salomonsen. (*Pitsiulak*) Black Guillemots breed in the region in most suitable fissured rocks and boulder heaps.

In 1954, on 7 March, they were common at the floe-edge near Cape Dorset and, on 15 May, two were observed in an open tide

rip 15 miles from the floe-edge. At the West Foxe Islands, the site of perhaps the largest breeding colony in the region, the first eggs were taken (with the aid of a spoon on a pole) from the rock-crannies on 1 July. Desiccated remains of the mailed sculpin (*Triglops* sp.) and, more abundantly, polar cod (*Boreogadus saida*) were found at the nesting site. Fully fledged, though flightless young, with down still clinging, were seen on 12 September 1954, on an island in north-east Andrew Gordon Bay. Adults were carrying fish and the gullets and stomachs of the many young guillemots killed all contained 2- to 5-inch polar cod.

in incomplete breeding plumage were seen after this date.

On 24 July 1954 McLaren observed a white-plumaged, possibly albinistic, guillemot in southeast Andrew Gordon Bay and a similar bird was seen at the West Foxe Islands on 5 August 1955 by Macpherson.

A bird collected on 15 May 1956 was banded at Upernavik, Greenland (Cooch, 1957).

The color of the tarsi and lining of the mouth in all specimens examined was *scarlet red*.

Weights of guillemots were recorded as follows:

TABLE 6. MEASUREMENTS OF BLACK GUILLEMOTS FROM CAPE DORSET (16-31 May, and 22 July, 1955)

Measurement	No.	Extremes	Mean	S.E.	S.D.	S.E.	C.V.	S.E.
MALES								
Flattened wing	8	161.0-170.0	166.0	.982	2.777	.6942	1.67	.42
Tarsus	8	30.0- 32.3	31.0	.275	.7783	.1946	2.51	.63
Exposed culmen	8	27.0- 31.0	29.36	.522	1.476	.3690	5.027	1.26
FEMALES								
Flattened wing	4	157.0-172.0	163.75	3.66	7.311	2.5848	4.46	1.58
Tarsus	4	30.0- 32.6	31.05	.602	1.204	.4257	3.88	1.37
Exposed culmen	4	25.4- 29.8	28.58	1.06	2.124	.7509	7.43	2.63

In 1955 Black Guillemots were frequently observed at the floe-edge from 10 to 31 May. On 6 July fresh eggs were taken by natives four miles east of Dorset and on 28 July about 75 pairs were believed breeding on Pitsulak Island. The first young, only a few hours old, was seen on 7 August.

The West Foxe Islands breeding colony was studied by Cooch in 1955 and 1956, and his report (1957) contains the following notes: prospecting for nest sites first observed on 15 June 1955, and 17 June 1956; peak of nesting period, in 1955 on 15 July, and 1956 on 18 July; first young found on 29 July 1955, and 2 August 1956; first flying young noted on 25 August 1955. He estimated the size of the breeding population as about 3,000 individuals.

On 7 March 1954 all guillemots seen were in winter plumage, but by 29 April some had begun to change. On 11 May 1955, of six seen, four were in breeding plumage, and of the same number seen on 31 May, five were in complete breeding plumage, the other still with a few white belly feathers. None

Males: 16 May-22 July (6)

390 gm, 430 gm, 405 gm, 350 gm, 330 gm, 410 gm; mean, 386 gm.

Females: 31 May-22 July (4)

435 gm, 370 gm, 325 gm, 360 gm; mean, 372 gm.

The measurements of Cape Dorset Guillemots (Table 6) agree well with those of Storer (1952) for *ultimus*, in which race he includes the south Baffin Island population.

SNOWY OWL *Nyctea scandiaca* (Linnaeus). (*Okpik*) Soper (1946) has recorded Snowy Owls breeding at Cape Dorset.

In 1954, when lemmings were very abundant, Snowy Owls were seen occasionally throughout the spring and summer from March to September. In 1955 the lemming population (particularly *Dicrostonyx*) was very low and no Snowy Owls were observed.

HORNED LARK *Eremophila alpestris alpestris* (Linnaeus). (*Kopanoakpak*) Horned Larks were very scarce as summer residents of the coastal region, but were common locally on migration. Soper (1928) saw them in the

Dorset region only between 3 and 10 June in 1926 and at the end of August in 1928.

In 1954, two were seen at the head of Andrew Gordon Bay on 17 June and another was seen two days later at the same place. Horned Larks were very common in migration near Andrew Gordon Bay and Korok Inlet in early September. In 1955, two were seen on 2 June near Dorset, and next day two flocks, each of six birds. On 6 July, one Horned Lark (possibly breeding) was seen on a five-hour walk inland from Keaktuk, a native camp some five miles east of Dorset.

NORTHERN RAVEN *Corvus corax principalis* Ridgway. (*Tulugak*) Ravens are evenly distributed in small numbers throughout the region.

On 19 May 1954 a pair was believed nesting on a sea cliff about eight miles southwest of the mouth of Korok Inlet. In 1955 a flock of 12 was seen circling a cliff near Dorset on 16 May, and thereafter one or two Ravens were seen almost every day.

On 21 August 1955 a pair was seen flying near a bay 11 miles west of Dorset. The female four times folded her left wing sideways and dived, looking as if she had completed a roll as she righted herself. An Eskimo accompanying Macpherson said that this was an omen of good luck in seal hunting. On 8 August 1955 an Oldsquaw egg was found under a stone near Chorkbak Inlet. The Eskimos said they had frequently found duck eggs hidden or buried and that these were cached by Ravens to eat during the winter.

WHEATEAR *Oenanthe oenanthe leucorhoa* (Gmelin). On 5 June 1954 three pairs of Wheatears were apparently nest-building at one of the Aitken Lakes, within about a mile of each other. A pair was seen at about the same time at Dorset by Tommy, the Hudson's Bay Company interpreter. Cooch (1957) noted a singing male at the West Foxe Islands on 20 June 1955. These appear to be the first records for Foxe Peninsula. Manning (Bray, 1943) took a specimen on 2 September 1939, at Taverner Bay, and Soper (1946) records the species from Lake Harbour.

WATER PIPIT *Anthus spinoletta rubescens* (Tunstall). (*Imierktaiyok*) Water Pipits breed sparsely throughout the region. They were first seen in 1954 on 28 May and were common at Dorset by 3 June. On 5 June they were very common at the Aitken Lakes, where territories were occupied and males singing before the flocks of Snow Buntings and Lapland Longspurs had dispersed. A

timed nuptial-song flight lasted four and a half minutes. Pipits were common in migration on 9 and 10 September near Korok Inlet.

In 1955 two small flocks, each of four birds, were seen at the Aitken Lakes on 28 May and two males were collected (testes: 8.5 and 9 mm respectively). The first nuptial flight was seen on 3 June; on 29 June, four pipits probably nesting, and on 2 July a nest, were seen on Okolli Island. The seven eggs were cream color, heavily overlain with Prout's brown in fine speckling and blending; one measured 19.2×14.8 mm. Two young had hatched by 9 July. Four days later, when another pipit on a different part of the island was observed carrying food, no more eggs of this clutch had hatched.

REDPOLL *Acanthis* sp. Redpolls are scarce on migration and apparently do not breed in this region. McLaren heard one on 5 June and he saw two on 7 September 1954, near Korok Inlet. On 26 May 1955 Macpherson saw a flock of 18 near Dorset, and on 3 June a flock of 10. Both flocks were very wild. Cooch (1957) recorded Redpolls as common spring and fall migrants at the West Foxe Islands in 1955 and 1956.

WHITE-CROWNED SPARROW *Zonotrichia leucophrys leucophrys* (Forster). A female White-crowned Sparrow, the first recorded from Foxe Peninsula, was collected in the mission shed at Dorset on 8 June 1955 (largest ovum 1 mm, little fat). The species has been observed at Lake Harbour by Peters (Shortt and Peters, 1942) and a juvenile female collected at Taverner Bay by Manning (Bray, 1943).

WHITE-THROATED SPARROW *Zonotrichia albicollis* (Gmelin). One of two White-throated Sparrows seen on the West Foxe Islands on 3 July 1955 was collected by Cooch (1957). This appears to be the first record from Baffin Island.

LAPLAND LONGSPUR *Calcarius lapponicus lapponicus* (Linnaeus). (Male: *Kaogodligak*; female: *Kringniktak*) The breeding population of Lapland Longspurs in this region is small, but they are common in migration.

In 1954 they were first noted on 2 June, when a few males were seen. Males were quite common at the Aitken Lakes on 5 and 6 June, but females were not noted until the 7th. Many Lapland Longspurs were seen near southeast and south Andrew Gordon Bay on 3 and 4 September, but they were scarce among the Snow Bunting flocks near Korok Inlet on 9 and 10 September. The last were seen on the 17th.

In 1955 Lapland Longspurs were first noted on 28 May, when two flocks totaling 22 birds were seen at the Aitken Lakes. Small flocks were observed around Dorset until 5 June. Lapland Longspurs were seen infrequently and in small numbers throughout the summer. Some were believed to be nesting a few miles from the coast near Keaktuk, where five males and two females were seen in a small area on 7 July. Five juveniles were seen on 8 August near Chorkbak Inlet and six on Sakkiak Island on the 16th. A flock of 20 was noted at Dorset on 15 August.

SNOW BUNTING *Plectrophenax nivalis nivalis* (Linnaeus). (*Kopanoak*) Snow Buntings are regular and common breeding birds, particularly in the more rocky parts of the region.

In 1954 the first Snow Bunting was seen on the sea ice of Andrew Gordon Bay on 19 April. Between 22 and 25 April they had become quite common around Dorset. The first male in flight song was seen on 7 May. In late May, Snow Buntings were still in flocks on the islands east of Chorkbak Inlet, although on sunny days singing males occupied territories. In early June, large flocks were moving inland through the Aitken Lakes and many resident males were in song. McLaren saw a few on his last walk of the season on 1 October.

A flock of six was seen on 10 May 1955, but practically all seen after the 15th were single males and pairs. A territorial combat was witnessed on 21 May. On 18 June, a female was seen carrying a feather and three days later her nest containing six warm eggs was discovered. The eggs were whitish, with *onionskin pink* mottling, and measured 22×16 mm. Flying young were first noted on 13 July and the nest mentioned above was vacated by the 19th. Small flocks of Snow Buntings were common on Dorset Island in mid-September.

REFERENCES

- BENT, ARTHUR CLEVELAND. 1951. Life histories of North American wild fowl. Vol. 2. New York.
- BRAY, R. J. O. 1943. Notes on the birds of Southampton Island, Baffin Island and Melville Peninsula. *Auk* 60:504-536.
- CADE, TOM J. 1955. Variation in the common Rough-legged Hawk in North America. *Condor* 57:313-346.
- COOCH, F. G. 1957. Birds observed in the vicinity of Cape Dorset, Baffin Island, in the summers of 1955 and 1956. Typed M.S. in National Museum of Canada.
- DELACOUR, JEAN. 1954. The waterfowl of the world. Vol. 1. London.
- JENNESS, D. 1928. The people of the twilight. New York.
- MACPHERSON, A. H. 1955. Field work on arctic gulls at Cape Dorset, N.W.T. Arctic Circular (Mimeo.) 8(4):74-78.
- MANNING, T. H. 1942. Blue and Lesser Snow Geese on Southampton and Baffin islands. *Auk* 59:158-175.
- . 1949. The birds of northwestern Ungava, p. 155-224. In "A Summer on Hudson Bay" by Mrs. Tom Manning. London.
- MANNING, T. H., E. O. HÖHN, and A. H. MACPHERSON. 1956. The birds of Banks Island. Bull. nat. Mus. Canada 143.
- RIDGWAY, R. 1912. Color standards and color nomenclature. Washington.
- SALOMONSEN, FINN. 1944. The Atlantic Alcidae. The seasonal and geographical variation of the auks inhabiting the Atlantic Ocean and the adjacent waters. Göteborg.
- SHORTT, T. M. and H. S. PETERS. 1942. Some recent bird records from Canada's eastern arctic. *Can. J. Res.*, D 20:338-348.
- SOPER, J. D. 1928. A faunal investigation of southern Baffin Island. Bull. nat. Mus. Canada 53.
- . 1930. Explorations in Foxe Peninsula and along the west coast of Baffin Island. *Geogr. Rev.* 20:397-424.
- . 1946. Ornithological results of the Baffin Island expeditions of 1928-29 and 1930-31 together with more recent records. *Auk* 63:1-24, 223-239, 418-427.
- STORER, ROBERT W. 1952. A comparison of variation, behavior and evolution in the sea bird genera *Uria* and *Cepphus*. Univ. Calif. Publ. Zool. 52:121-222.
- SUTTON, G. M. 1932. The exploration of Southampton Island, Hudson Bay; the birds of Southampton Island. Mem. Carnegie Mus. 12, Pt. II, Sect. 2.
- THIBERT, ARTHUR, O.M.I. 1954. English-Eskimo, Eskimo-English Dictionary. Ottawa.
- TODD, W. E. CLYDE. 1938. A new eastern race of the Canada Goose. *Auk* 55: 661-662.
- WYNNE-EDWARDS, V. C. 1952. Zoology of the Baird Expedition (1950) I. The birds observed in central and southeast Baffin Island. *Auk* 69:353-391.

FRITS JOHANSEN

1882 - 1957

With the death of Frits Johansen the Ottawa Field-Naturalists' Club has lost one of its foremost interested supporters and contributors and one of the foremost Canadian naturalists of the early part of this century.

Frits Johansen was born in Copenhagen, Denmark, in 1882, and following his early schooling he was engaged in successive marine biological expeditions to the Faroes, Iceland, and East Greenland. He published several articles on the excellent collections he brought back.

In 1912 he moved to Ottawa where he became a member of the Canadian Arctic Expedition under Viljalmur Stefansson. It was during the period 1913-1916, while acting as the Expedition's collector of biological specimens in Alaska and the western Canadian Arctic, that he made his greatest contribution to science. On returning to Ottawa he was engaged in working up his collections and taking part in other expeditions, one being the Cheticamp Expedition of 1917 in the Gulf of St. Lawrence. From 1922 to 1929 he was employed for various periods by the Department of Marine and Fisheries and the forerunner of the Fisheries Research Board. During this time he made a number of collecting trips in Eastern Canada, including Anticosti Island and Newfoundland, with an important expedition to the Hudson Strait region in 1927. In 1929 he returned to Denmark where he continued his studies on natural history until his death.

During the period 1906 to 1936 Frits Johansen published some 30 papers, about two-thirds of which, in addition to a number of faunal notes and reviews, appeared in the *Canadian Field-Naturalist*. During the Canadian Arctic Expedition it fell on Mr. Johansen to collect plants and, very largely because of his indefatigable industry, the results became relatively important in arctic botany. These comprised two entire volumes of the reports, by various authors. His own report on general botanical observations contains the first comprehensive description of the vegetation of the western North American Arctic. His zoological contributions include the material on which all the invertebrate papers, comprising seven volumes, were based, and he was author of three faunistic reports, in one of which he described the phyllopod crustacean *Artemiopsis stefanssoni*. A number of newly described species of animals bore his name.

During his stay in Ottawa he was a full member of the Ottawa Field-Naturalists' Club, and was a member of Council during 1926-1927. He remained a subscriber to the *Canadian Field-Naturalist* for many years after his return to Denmark. His main faunistic interest was in the smaller crustaceans, particularly phyllopods, isopods, and amphipods, and he explored the Ottawa region for them assiduously.

Frits Johansen was an example of what today is almost a rarity among biologists: a naturalist. Perhaps his very breadth of interest and knowledge made it difficult for him to concentrate on major problems in a given field; his writings tended to include too many nonpertinent details and they lacked conciseness. These, together with his increasing individuality, are perhaps the reasons why Frits Johansen's contributions as a naturalist have not been fully recognized as they undoubtedly deserve. He was exceptionally observant and thorough in his methods, and he had the necessary driving enthusiasm to surmount the difficult conditions under which he often worked. By those who follow in his path he will be remembered as a pioneer in the exploration of Canadian plant and animal resources.

A. E. PORSILD
E. L. BOUSFIELD

THE BIRDS OF KLEENA KLEENE, CHILCOTIN DISTRICT, BRITISH COLUMBIA, 1947-1958

W. ADRIAN B. PAUL

Kleena Kleene, British Columbia

INTRODUCTION

KLEENA KLEENE is situated in the Chilcotin District (at 51°58' N and 124°59' W) on the eastern slope of the Coast Mountains of British Columbia. It is 135 miles directly west from Williams Lake on the road to Bella Coola. The Klinaklini River flows through One Eye Lake and south through a gap in the coastal ranges west of Mount Waddington (elevation 13,260 feet) to the head of Knight Inlet which is tidal. Knight Inlet is a narrow fjord extending south and west for 70 miles before reaching Queen Charlotte Strait at the northern end of Vancouver Island.

Kleena Kleene lies on what is almost a triple divide, although the country immediately around is fairly flat or rolling. Just to the north is the drainage into the Dean and Bella Coola rivers. Just east of Kleena Kleene the drainage is into the Chilcotin River, and ultimately into the Fraser River. To the south-east Tatlayoko Lake and the west branch of the Homathko River drain southwards, on the east side of Mount Waddington, into Bute Inlet. Bute Inlet extends some 65 miles to the south towards the Strait of Georgia. The deep penetration of these channels into the mountains from the sea is of some influence upon the early appearance of ducks and other birds at Kleena Kleene in the spring. Ducks winter in considerable numbers on these inlets.

Kleena Kleene itself lies at about 3000 feet of elevation. Tree line is at 6000 feet. Being in the rain shadow of the mountains, Kleena Kleene has a climate that is semiarid, the average annual rainfall being only 13 inches. The soil is largely glacial drift (sand, and sand or clay loams) and the predominant tree in the bench and bottom lands is lodgepole pine *Pinus contorta*, known locally as 'jack pine.' This species forms about 80 percent of the forest cover while 15 percent is composed of aspen *Populus tremuloides*, known locally as 'poplar.' Spruce (*Picea* sp.), cottonwood *Populus trichocarpa*, alder (*Alnus* sp.) and willow (*Salix* spp.) are found along the rivers and alongside swamp meadows. Douglas fir *Pseudotsuga menziesii* is found on the foothills. Two species of juniper occur, as well as kinnikinnick *Arctostaphylos uva-ursi* and soopolallie *Shepherdia canadensis*.

For about five months in the year, from early November to April, the lakes are frozen and the ground is snow-covered, but the depth of snow seldom exceeds two feet. Thawing in midwinter or early spring may cause an ice crust on the snow. One important feature of the region is its proximity to the sea and with westerly or southwesterly winds temperatures rise above zero. However there remains a marked temperature gradient in winter between Kleena Kleene and the coast. The mean temperature at Kleena Kleene in January is 8° F, while at Tatlayoko Lake it is 18° F, and at Bella Coola it is 27° F. Weather reports in winter sometimes refer to "winds blowing down coast inlets." Under such conditions birds may be quickly transported from the interior to the coast. In spring the converse may be true, namely that

breezes blow up the inlets from the west. Kleena Kleene is one of the earliest places in the Chilcotin or Cariboo districts to report spring migrants. Much of the interest of my records lies in these early spring, and late fall, migration dates.

In this district there are five categories of birds: year-round residents; winter visitants from higher altitudes or farther north; summer visitants or residents, which pass down the Klinaklini or Homathko canyons when the weather becomes really cold; spring migrants passing up the inlets northeast from the coast; and the main spring visitation from more southern climates.

The observations recorded here cover the years 1947-58 and, unless otherwise stated, they were made within a five-mile radius of the outlet of One Eye Lake. I used eight-power binoculars. I was in a specially advantageous position to watch waterfowl as my living quarters were only 100 feet from the outlet of One Eye Lake, where there is open water until temperatures fall well below zero. I have seen various kinds of hawks, sandpipers, fly-catchers, wrens, thrushes, finches and sparrows which, owing to difficulties of certain identification, have generally been omitted from the systematic list. Observations in the later years were more reliable and more complete than in the earlier years. "Archie" Lake, referred to in the text, is at Brink's ranch, one mile west of One Eye Lake.

There are only about 25 persons living in the Kleena Kleene district. These include residents of two cattle ranches which have extensive hay meadows. There has been little logging in this area, but much of the landscape was burnt over many years ago and the country is now covered with a fire type of forest composed mainly of *Pinus contorta*. In many places *P. contorta* appears as a climax species. Nomenclature follows the *A.O.U. Check-List* (5th Edition, 1957).

No systematic list of the birds of the Kleena Kleene area, based on year-round observations, has been published previously. However, Frank M. Shillaker who has been living near Chezacut for 37 years has kept a diary of the birds seen in that district. There is a copy of the section covering the 21 months from February 1939 to October 1940 in the Department of Zoology at the University of British Columbia (where it is known as the Shillaker MS). The diary records year-round observations for the Chezacut (Chilcotin Lake) area, only 50 miles to the northeast of Kleena Kleene. Some records, given for comparison with mine, are abstracted from the Shillaker manuscript, and will be indicated by the symbol (S). Some other comments, made in a letter written by Mr. Shillaker on November 15, 1957, will also be included.

Mr. Shillaker found that at Chezacut crows appeared in late February or the first half of March, but frequently Killdeer, Meadowlarks and Juncos appeared as early as the crows. Some of the species he watched on the spring migration seem to have been observed earlier, at Chezacut, than I have recorded them at Kleena Kleene, but the significance of this is uncertain. He recorded Canada Goose, Mallard, Pintail, Marsh Hawk, Yellowlegs, Robin, Mountain Bluebird, Redwinged and Brewer's Blackbird during March.

ACKNOWLEDGMENTS

I wish to acknowledge the help of the following who, during the preparation of this paper, have assisted me at various times: W. Earl Godfrey, Miss Mary F. Jackson, M. T. Myres, Theed Pearse, Frank M. Shillaker and John S. Tener.

SYSTEMATIC LIST

COMMON LOON *Gavia immer* (Brünnich). Summer resident; migrates in small flocks; breeds on One Eye Lake and Clearwater Lake. Spring migration: May 11, 1954, eleven in one flock. Fall migration: Oct. 19, 1949, four seen. Nesting: June 24, 1956, pair with one chick; July 9, 1954, pair with two young; Aug. 6, 1950, one with a half-grown chick.

RED-NECKED GREBE *Podiceps grisegena* (Boddaert). Summer visitant. Breeds on "Archie" Lake, but not plentiful. Nesting: July 10, 1951, one with three half grown young; July 16, 1948, several including one pair with young.

HORNED GREBE *Podiceps auritus* (Linnaeus). Summer visitant, possibly breeds. Summer records: May 8, 1954, one seen; June 10, 1950, one pair.

EARED GREBE *Podiceps caspicus* (Hablizl). Rare summer visitant, but breeds on a lake near Riske Creek (M. T. Myres). One record of a single bird on October 10, 1950.

WESTERN GREBE *Aechmophorus occidentalis* (Lawrence). Summer visitant; a small flock of about 10 birds (apparently not breeding) spends each summer on One Eye Lake. Fall migration: Nov. 4, 1949, one with young birds; Nov. 10, 1949, two adults and one other.

PIED-BILLED GREBE *Podilymbus podiceps* (Linnaeus). Apparently transient only. Spring migration: April 20, 1953, one pair; April 24, 1954, two seen.

WHITE PELICAN *Pelecanus erythrorhynchos* Gmelin. Not observed at Kleena Kleene until July 1957, when two were seen. A few birds, apparently nonbreeders, spend the summers on Nimpo Lake which is 25 miles north of Kleena Kleene. During migration large numbers, up to a hundred or more, are seen on Nimpo Lake and at Anahim Lake, twelve miles still farther north. On August 5, 1956, I saw two birds on Nimpo Lake.

It is of some interest to review our knowledge of the White Pelican in the interior of British Columbia. The only known nesting colony in the province is at Stum Lake, northeast of Alexis Creek in the Chilcotin District (Munro, 1945), but Munro and Cowan (1947) reported that unverified nesting places included Charlotte, Puntze and Tzenaicut Lakes, all lying north of a line from Kleena Kleene to Riske Creek, and extending from the Nimpo Lake region to the

Fraser River. Shillaker (in a letter) states that there is no proof of breeding at Puntze Lake. Confirmed summer records include birds at Chilcotin Lake, Maxwell's Lake near Chezacut, and Nulki Lake near Vanderhoof (Munro and Cowan, 1947). Racey (1933) saw four or five daily at Chezacut Lake in 1931 during the summer. Frank Shillaker saw White Pelicans at Chezacut Lake on June 14, 1939 (one), and in 1940 on July 24 (a number) and Sept. 4, 11 and 12 (a few). He recorded them (S) on Maxwell Lake as follows: 1939—June 12 (three), June 22 (12); 1940—June 2 (14; they were coming regularly to feed in the afternoon), June 16 (one or two), July 29 (one), Aug. 12 and 16 (two). Munro (1945) published records for Maxwell's Lake in 1941 supplied by the same observer. These sightings extended from May 3 to Sept. 3, 1941.

GREAT BLUE HERON *Ardea herodias* Linnaeus. Occasional winter visitant. Seen once or twice standing on ice near the water's edge. Shillaker (in a letter) has seen herons several times between Redstone and Chilanko Forks. There is no evidence of a local breeding colony.

AMERICAN BITTERN *Botaurus lentiginosus* (Rackett). Summer visitant; believed to nest near One Eye Lake and "Archie" Lake. Summer records: May 27, 1949, one heard; June 12, 1948, one seen; June 19, 1951, one heard; July 3, 1948, one heard.

TRUMPETER SWAN *Olor buccinator* Richardson. Occasional visitant both summer and winter. Some of the spring records probably refer to Whistling Swans *Olor columbianus*, since Shillaker (in a letter) sees Whistling Swans frequently in spring and fall at Puntze Lake and Chezacut Lake. Shillaker states that the Whistling Swans are much wilder than the Trumpeter Swans which are "very gentle and fearless and come in very close to the lake shores." Winter records: Nov. 12, 1950, one immature bird; Nov. 27 and 29, 1948, one adult and one immature bird; Jan. 15, 1949, one mature bird joined by a second mature bird on Feb. 14 and by a third bird on Feb. 23; Jan. 19, 1953, four stayed about a week. Spring migration: April 10, 1954, five stayed for several days. Summer records: May 7, 1951, four arrived and stayed for three weeks on One Eye Lake; May, 1955, one mature bird stayed on Clearwater Lake for two weeks; July 31, 1956, one mature bird on Clearwater Lake.

The number of winter records is perhaps interesting, since it indicates a tendency to wander during this season. It is possible that these birds might be members of the Lonesome Lake herd on the way to or from visits to the coast. Lonesome Lake lies only 40 miles away to the northwest on the Atnarko River which drains out of Charlotte Lake through steep mountains into the Bella Coola River.

CANADA GOOSE *Branta canadensis* (Linnaeus). Members of large races (*canadensis* and *occidentalis* or both) predominate. Several pairs nest on One Eye Lake; a small flock, apparently of nonbreeding birds, spends early summer at Brink's ranch (accompanied once or twice by a single member of a smaller form). Flocks, occasionally quite large, are seen sometimes on migration. Spring migration: March 30, 1948, 25 seen; March 30, 1949, one seen; April 4, 1949, about 30; April 6, 1953, 10 seen; April 8, 1950, two seen; April 12, 1954, six seen. Nesting: May 2, 1947, started incubating 5 eggs; June 2, 1953, three pairs, each with very young goslings. Summer record: May 30, 1954, 60 seen. Fall migration: Nov. 25, 1953, 300 in one flock.

SNOW GOOSE *Chen hyperborea* (Pallas). I have never seen a Snow Goose here, although they migrate through the Cariboo District in spring (Munro and Cowan, 1947).

DUCKS. In general spring migrants appear about mid-April, but there are also a few ducks which work their way up from the coast at any time during the winter, even when the temperatures touch zero. Mallard, American Widgeon, Bufflehead, Barrow's Goldeneye and Common Merganser definitely breed here; there is also good reason to think that Pintail, Ring-neck and Lesser Scaup also breed here. Shoveler *Spatula clypeata*, Canvasback, and Red-breasted Merganser *Mergus serrator* are rarely seen. Common Goldeneye appear only as passage migrants. Blue-winged Teal *Anas discors*. Redhead *Aythya americana*, and Harlequin Duck have never been seen here.

MALLARD *Anas platyrhynchos* Linnaeus. Breeds. Winter records: Jan. 21, 1953, six; Jan. 27, 1952, two males; Jan. 31, 1949, nine males and one female. Spring migration: April 2, 1953, 16 of mixed sexes; April 14, 1951, 14 seen; April 15, 1949, eight pairs; April 19, 1950, fifty.

PINTAIL *Anas acuta* Linnaeus. Probably breeds. In 1940 there was an enormous spring migration of Pintail through Chezacut (S). Winter records: Dec. 3, 1952, one pair. Spring migration: April 11, 1950, nine seen; April 15, 1949, eight pairs; May 6, 1951, several. Fall migration: Nov. 17, 1952, three seen.

GREEN-WINGED TEAL *Anas carolinensis* Gmelin. One can be sure of seeing six or eight pairs during migration. Spring migration: April 7, 1952, nine seen; April 17, 1954, several.

AMERICAN WIDGEON *Mareca americana* (Gmelin). Breeds. Spring migration: April 24, 1954, 24 seen; April 27, 1950, several pairs.

WOOD DUCK *Aix sponsa* (Linnaeus). Rare. Two males seen June 27, 1947. Shillaker who has been at Chezacut for 37 years has never seen them there.

RING-NECKED DUCK *Aythya collaris* (Donovan). Regular summer visitor, in small numbers. Spring migration: April 11, 1954, four males and a female. Summer record: June 6, 1949, one pair on a small lake for last month.

CANVASBACK *Aythya valisineria* (Wilson). Rare. Spring migrants seen on April 5 (two) and April 14 (one), 1950.

LESSER SCAUP *Aythya affinis* (Eyton). Summer resident. Believed to breed locally. Spring migration: April 27, 1950, several pairs; May 6, 1951, one pair. Summer record: June 6, 1949, three pairs on a small lake over the last month.

[GREATER SCAUP *Aythya marila* (Linnaeus)]. Frequently scaup (probably this species) are seen in winter. Records include: Jan. 22, 1949 (one pair) and Jan. 26, 1952 (two).

COMMON GOLDENEYE *Bucephala clangula* (Linnaeus). A few seen briefly during the spring migration. Do not breed. Winter records: Jan. 29, 1954, one male and two females; Feb. 17, 1951, one male and three females. Spring migration: April 16, 1954, ten seen; April 23, 1950, five males and two females; May 6, 1951, one pair.

BARROW'S GOLDENEYE *Bucephala islandica* (Gmelin). Regular summer visitor. Breeds. Winter records: Dec. 29, 1948, one male; Feb. 20, 1950, three seen. Spring migration: April 27, 1950, several pairs. Breeding: June 7, 1949, female with seven young; June 12, 1951, two females with broods; June 30, 1948, female with nine young. Fall migration: Oct. 19, 1949, twelve seen.

BUFFLEHEAD *Bucephala albeola* (Linnaeus). Regular summer visitor. Breeds. Winter record: Nov. 2, 1952, four. Spring migration: April 18, 1953, some; April 22, 1950, five males and three females. Summer record: June 6, 1949, two pairs on a small lake for the last month.

HARLEQUIN DUCK *Histrionicus histrionicus* (Linnaeus). This bird is to be expected on mountain streams to the west, but I have never seen it on the reaches of the Klinaklini River near my home. Shillaker (in a letter to M. T. Myres on October 17, 1957) writes "I have not in 37 years of bird watching noted this bird at all in that part of the Chilcotin within a radius of 25 miles of Chezacut, nor in that part of the district covering the headwaters of the Nazko i.e. Franklin Meadows, Aneko Creek, Ross Creek, nor have I spotted it in any part of Alexis Creek (the creek, not the village), nor on the Chilcotin River from Chezacut to Riske Creek." Just why these streams are unsuitable for the Harlequin Duck is by no means clear (M. T. Myres).

SURF SCOTER *Melanitta perspicillata* (Linnaeus). One can expect to see a small, apparently nonbreeding, flock of about 10 birds on One Eye Lake for a considerable part of any summer. Spring migration: May 9, 1957, six male and three females. Summer record: June 27, 1951, twelve males.

RUDDY DUCK *Oxyura jamaicensis* (Gmelin). Rare. Two summer records only: June 6, 1949 (one pair, which left soon afterwards) and June 24, 1948 (two males).

HOODED MERGANSER *Lophodytes cucullatus* (Linnaeus). Rare transient. Spring migration: April 5, 1953, one pair; April 24, 1954, one pair. Fall migration: Oct. 17, 1950, two; Nov. 3, 1951, a pair.

COMMON MERGANSER *Mergus merganser*. Linnaeus. Summer resident, occasional in winter. Breeds. Winter record: Dec. 4, 1953, two. Spring migration: April 1, 1953, eleven; April 10, 1952, six. Breeding: June 17, 1951, female with young; June 24, 1952, ten young (about 10 days old); June 30, 1948, young, about two weeks old. Fall migration: Nov. 13, 1952, one male; Nov. 16, 1949, flock of 80 males and two or three females, on One Eye Lake.

GOLDEN EAGLE *Aquila chrysaetos* (Linnaeus). Rare. A pair spent several days on a cliff overlooking "Archie" Lake (June, 1947).

BALD EAGLE *Haliaeetus leucocephalus* (Linnaeus). Seen, singly, fairly frequently. Spring: Feb. 5, 1950, one; Feb. 22, 1949, one; March 1, 1954, two. Nesting: June 12, 1949, one at nest; July 13, 1954, two fledglings ready to leave nest. Autumn: July 6, 1947, one; Nov. 15, 1948, One.

MARSH HAWK *Circus cyaneus* (Linnaeus). Individuals of both sexes are noted near One Eye Lake frequently during the breeding season, and are believed to breed.

OSPREY *Pandion haliaetus* (Linnaeus). Fairly abundant summer resident. Nests were found in 1953 and in 1957. Often seen at Chezacut (S).

SPARROW HAWK *Falco sparverius* Linnaeus. Fairly common summer resident.

BLUE GROUSE *Dendragapus obscurus* (Say). Often heard drumming at 4000 feet in spring on fir-clad foothills. Seldom heard or seen at 3000 feet. Shillaker remarks (in a letter) that in the lower Chilcotin the Blue Grouse does "not appear to extend beyond Ross' Hill at Redstone." Munro and Cowan (1947) state that "there are large areas in the interior entirely unoccupied by blue grouse, one being that part of the Cariboo Parklands between the Thompson and Fraser rivers from approximately 70 Mile on the Cariboo Road for an undetermined distance north." The race *pallidus* has once been taken at Hanceville. Apart from this there are no specimens listed by Munro and Cowan (1947) in the area between Lillooet (*pallidus* showing intergradation with *fuliginosus*), Squamish Valley region (*fuliginosus*) and Francois Lake (*richardsonii*). It is evident therefore that the limit of the northwestern breeding range of *pallidus* is unknown and that the point between Vancouver Island and Prince Rupert at which *fuliginosus* gives way to *richardsonii* and *sitkensis* is also unknown. Kleena Kleene records follow. Spring: April 10, 1949, two drumming; Summer: June 6, 1948, a hen at 4000 feet.

SPRUCE GROUSE *Canachites canadensis franklinii* (Douglas). Fairly common. Two males seen May 23, 1948. Nesting: June 9, 1953, nest with four eggs on Mount Nogwon; July 12, 1954, female with young.

RUFFED GROUSE *Bonasa umbellus* (Linnaeus). Plentiful. Spring record of drumming, April 17, 1957. Nesting: May 18, 1948, five eggs (three more added later); June 17, 1951, several seen with young; June 29, 1956, still drumming.

WILLOW PTARMIGAN *Lagopus lagopus* (Linnaeus). Appear at 3000 feet in winter, moving higher into the adjacent mountains to breed in April. Eggs are laid in early June. Winter observation of three at 3000 feet in a swamp on Jan. 3, 1953.

[ROCK PTARMIGAN *Lagopus mutus* (Montin)]. Altitudinal distribution and movements as in the Willow Ptarmigan. Breed in large numbers in the adjacent mountains. Winter observation of twelve at 3000 feet on Jan. 20, 1956. M. T. Myres states that this record, if correct, would be an extension of breeding range southward from Hazelton, and must be questioned until substantiated by specimens.

WHITE-TAILED PTARMIGAN *Lagopus leucurus* (Richardson). Three, all pure white, were seen in full view at 3000 feet on April 18, 1958.

SHARP-TAILED GROUSE *Pedioecetes phasianellus* (Linnaeus). Fairly plentiful. This species is evidently quite abundant at Chezacut where there were many in the winter of 1938-39. A flock of about 50 was seen in jack pines in the first week of March 1939 (S). Winter records: Oct. 26, 1956, six seen; Feb. 13, 1949, ten seen.

SANDHILL CRANE *Grus canadensis* (Linnaeus). Never observed here, whereas Shillaker (in a letter) regularly observes them migrating at Chezacut; a few breed there.

AMERICAN COOT *Fulica americana* Gmelin. Plentiful summer resident which breeds here (June 19, 1949). Spring migration: April 7, 1950, one; April 28, 1957, 25 seen.

KILLDEER *Charadrius vociferus* Linnaeus. Occasional, but may breed. Spring migration: March 25, 1948, observed; April 13, 1947, one. Summer record: May 20, 1956, one.

WILSON'S SNIPE *Capella gallinago* (Linnaeus). Infrequent summer resident. Mating display noted in 1956 and 1957. Summer observation July 9, 1956 (two seen). Common breeding species at Chezacut (Shillaker, in a letter). Spring migration: April 9, 1952, two. Fall migration: Nov. 4, 1953, two.

SPOTTED SANDPIPER *Actitis macularia* (Linnaeus). Undoubtedly nesting; seen on four dates during May and June, 1958, but not previously.

GREATER YELLOWLEGS *Totanus melanoleucus* (Gmelin). Arrive in April and breed here. Spring migration: April 18, 1950, flock of twelve standing on the ice; April 26, 1947,

two. Summer records: June 8, 1947, several; June 20, 1956, nesting pair.

HERRING GULL *Larus argentatus* Pontoppidan. Often seen on larger lakes throughout summer. Spring migration: April 27, 1949, flock of 100 moving east, and another of 70 moving east.

BONAPARTE'S GULL *Larus philadelphia* (Ord). Observed in summer (July 20, 1951, twenty on One Eye Lake). Nesting: June 4, 1948, nest in a 50-foot spruce.

BLACK TERN *Chlidonias niger* (Linnaeus). Regular summer visitors. Seen at "Archie" Lake on hot afternoons in late June or July. Summer records: June 5, 1949, a number; June 24, 1948, a dozen; July 19, 1953, some; June 22, 1958, eight.

BAND-TAILED PIGEON *Columba fasciata* Say. Seen June 4, 1958.

MOURNING DOVE *Zenaidura macroura* (Linnaeus). Rare. Noted only in late summer (Aug. 6, 1949, one and Sept. 13, 1958, three). One seen near Chezacut on May 14, 1939 (S).

GREAT HORNED OWL *Bubo virginianus* (Gmelin). Fairly common for several months each year, disappearing in summer. One seen Nov. 1, 1953. Shillaker (S) had Horned Owls at Chezacut all winter, as well as breeding in summer. One shot at Chezacut about March 28, 1939, had a porcupine quill in its foot (S).

HAWK OWL *Surnia ulula* (Linnaeus). One, Oct. 23, 1956.

SHORT-EARED OWL *Asio flammeus* (Pontoppidan). One, believed to be of this species, seen Dec. 13, 1953.

NIGHTHAWK *Chordeiles minor* (Forster). Common during the summer and probably breeds. A distraction display once observed. Summer records: June 5, 1949, a number; June 8, 1947, several at "Archie" Lake; June 19, 1951, heard 3 a.m.; Aug. 11, 1956, five.

BLACK SWIFT *Cypseloides niger* (Gmelin). Regular summer visitor. Observed June 8, 1947, "Archie" Lake; June 19, 1949, several; June 24, 1956, six at Clearwater Lake; July 5, 1956, two at Clearwater Lake; Sept. 1, 1956, two. It is not known where they are breeding, if indeed at all, in this vicinity.

RUFIOUS HUMMINGBIRD *Selasphorus rufus* (Gmelin). Arrive in May and nest here. Fairly common. Summer records: May 15-18, 1947, a female; May 19, 1947, a male; May 31, 1955, one seen; Aug. 2, 1957, a female.

BELTED KINGFISHER *Megaceryle alcyon* (Linnaeus). Regular summer resident;

breeds. Occasionally seen in winter. Winter records: Jan. 1, 1953, one; Jan. 26, 1952, one. Spring migration: March 7, 1953, one; March 31, 1951, one. Fall migration: Nov. 26, 1951, one.

RED-SHAFTED FLICKER *Colaptes cafer* (Gmelin). Common summer resident; breeds. Migration occurs at about the same time as the Robin (April 1 and November 1). Winter record: Dec. 10, 1948, one (6 inches of snow. Temp. + 10°F). Spring migration: Arrived March 20, 1947. Fall migration: Nov. 7, 1948, one seen.

PILEATED WOODPECKER *Dryocopus pileatus* (Linnaeus). Observations at any time: Feb. 17, 1957, one; March 31, 1954, one; April 15, 1952, two; April 27, 1953, one; June 13, 1956, one; Aug. 9, 1947, two; Aug. 21, 1949, one and Oct. 12, 1953, one.

RED-NAPED SAPSUCKER *Sphyrapicus varius nuchalis* Baird. Regular summer resident; breeds. Nesting: June 29, 1952, nest with young; July 11, 1954, nest; July 14, 1956, nest with young.

RED-BREASTED SAPSUCKER *Sphyrapicus varius ruber* (Gmelin). May breed. Observations include April 12, 1953, one; May 10, 1954, one.

HAIRY WOODPECKER *Dendrocopos villosus* (Linnaeus). Present all through the winter. Probably breeds at higher levels (less often seen in summer). Winter records: Nov. 26, 1951, one female; Dec. 4, 1950, one male; Jan. 1949, one female; Jan. 8, 1950, one male; Jan. 16, 1949, one male. Summer record: May 2, 1948, one.

DOWNY WOODPECKER *Dendrocopos pubescens* (Linnaeus). May breed in vicinity. Observations on March 17, 1954, one female; June 23, 1956, a pair.

EASTERN KINGBIRD *Tyrannus tyrannus* (Linnaeus). Rare summer visitor. Observations only on June 9, 1947, three, June 10, 1956, one; June 16, 1957, one.

WESTERN WOOD PEWEE *Contopus sordidulus* Sclater. Seen, and heard singing, June 6, 1958.

HORNED LARK *Eremophila alpestris* (Linnaeus). Spring migration: May 28-30, 1955, a flock. May be more abundant on the spring migration than this one record indicates.

VIOLET-GREEN SWALLOW *Tachycineta thalassina* (Swainson). Arrive each spring and breed here. Apparently may use burrows of Rough-winged Swallows for nesting. Large flocks noted in late July. Spring migration: April 13, 1956, some; April 28, 1952,

twenty. Summer records: July 13, 1948, two dozen; July 24, 1952, 200; July 27, 1953, 100+.

TREE SWALLOW *Iridoprocne bicolor* (Vieillot). Arrive each spring and nest plentifully. After breeding they disappear from Kleena Kleene, but considerable numbers were noted near Nimpo Lake on Aug. 5, 1956. Spring migration: April 16, 1949, first arrived: April 17, 1949, a bird house occupied; April 18, 1949, 100-200 present, but disappeared after one day.

ROUGH-WINGED SWALLOW *Stelgidopteryx ruficollis* (Vieillot). I believe there are no Bank Swallows *Riparia riparia* here. Rough-winged Swallows are quite common, and breed in holes in banks and cliffs. Spring migration: April 13, 1956, some; April 30, 1954, two. Summer records: May 25, 1948, one; June 28, 1947, pair with nest.

CLIFF SWALLOW *Petrochelidon pyrrhonota* (Vieillot). Arrive early May and nest in large colonies in local barns. Disappear in August. Spring migration: May 9, 1948, May 11, 1953.

GRAY JAY *Perisoreus canadensis* (Linnaeus). Resident. Roughly one pair per thousand acres. Incubation begins in March (March 20, 1947) and broods may be seen traveling with the parents in May and June (May 21, 1953; May 24, 1951; June 16, 1956; June 24, 1956).

STELLER'S JAY *Cyanocitta stelleri* (Gmelin). One Spring record (March 22, 1958, one). Occasional in autumn (single birds seen Oct. 25, 1947; Nov. 15, 1948 and Dec. 31, 1950).

BLACK-BILLED MAGPIE *Pica pica* (Linnaeus). Occasional in fall and winter. Shillaker (in a letter) notes an increase at Chezacut in recent years. Winter records: Oct. 2, 1947, one; Oct. 27, 1947, two; Nov. 12, 1950, two stayed some days; Jan. 9, 1949, one; Jan. 11, 1953, one; March 1, 1954, four.

RAVEN *Corvus corax* Linnaeus. Rare. Observed in winter (single birds on Feb. 5, 1950; March 1, 1954 and March 29, 1955).

COMMON CROW *Corvus brachyrhynchos* Brehm. Occasional in winter. Small flocks arrive about mid-March. Breed, usually, somewhere in the general vicinity. Large flocks seen in early fall. Winter records: Jan. 1, 1950, one; Jan. 9, 1949, one. Spring migration: March 7, 1947, small flock; March 25, 1950, small flock. Fall migration: Aug. 29, 1950, 80; Sept. 15, 1956, 150.

CLARK'S NUTCRACKER *Nucifraga columbiana* (Wilson). Fairly common at 3000 feet all winter, usually around habitations. In sum-

mer mostly at higher elevations. By contrast Shillaker (S) only reported them staying through the whole winter at Chezacut, during the very mild winters, such as 1939-1940. Winter records: Nov. 12, 1950, one; Dec. 12, 1948, one in garden for several days; Jan. 1949, one at feeding table; Jan. 1, 1949, one at 4000 feet. Summer records: April 3, 1949, two at 3500 feet; June 6, 1948, one at 4000 feet, catching flying insects; June 27, 1948, several at 3500 feet; July 16, 1951, one at 3000 feet.

BLACK-CAPPED CHICKADEE *Parus atricapillus* Linnaeus. Quite plentiful, especially in winter. When temperatures are below -40° F., they do not visit the feeding table.

MOUNTAIN CHICKADEE *Parus gambeli* Ridgway. Quite plentiful, especially in winter. When temperatures are below -40° F., they do not visit the feeding table. Four seen at 4000 feet on Jan. 1, 1949.

RED-BREADED NUTHATCH *Sitta canadensis* Linnaeus. Uncommon. Jan. and Feb. 1948. One at feeding table daily. May 7, 1953, one; May 16, 1957, one; June 13, 1958, July 4, 1954, one; Sept. 11, 1956, one; Sept. 5, 1958, six plus.

DIPPER *Cinclus mexicanus* Swainson. Occasional in winter and sometimes sings in zero weather. Never observed in the breeding season. One spring record: April 4 and 5, 1958, a pair. Winter records: Oct. 10, 1947, one singing; Nov. 20, 1950, two seen; Dec. 24, 1950, one; Dec. 29, 1949, one; Jan. 1, 1950, one (temp. -24° F.); Jan. 3, 1954, one; Jan. 24, 1949, one singing (temp. previous night -25° F.), two seen.

WINTER WREN *Troglodytes troglodytes* (Linnaeus). Seldom noticed. One observed April 14, 1957, and March 28, April 5 and Sept. 13, 1958.

LONG-BILLED MARSH WREN *Telmatodytes palustris* (Wilson). Sings and nests in tules surrounding small lakes.

ROBIN *Turdus migratorius* Linnaeus. Usually arrives in flocks in mid-March, leaving about November 1. Breeds commonly (about 1 nest per 100 acres). Spring migration: early March, 1947; March 16, 1949, one; March 20, 1951; first week April, 1948; April 10, 1956 (singing). Fall migration: Oct. 26, 1950, still present; early Nov. 1946, last seen.

VARIED THRUSH *Ixoreus naevius* (Gmelin). Passage migrant for two or three weeks in the spring; arriving at the same time as the Robins. Not seen in the breeding season. Fall migration: Oct. 29, 1950, three.

HERMIT THRUSH *Hylocichla guttata* (Pallas). Observed, June 3, 1958.

VEERY (WILLOW THRUSH) *Hylocichla fuscescens* (Stephens). Seen, and heard singing, June 2, 1958.

MOUNTAIN BLUEBIRD *Sialia currucoides* (Bechstein). Arrives early April and usually disappears after nesting. Nests occur near every habitation. Spring migration: April 1, 1951, one male; April 5, 1953, four seen. Nesting: May 30, 1956, eggs; June 4, 1957, young; June 24, 1956, young in nest.

TOWNSEND'S SOLITAIRE *Myadestes townsendi* (Audubon). First recorded breeding here in 1951; now quite plentiful. Many nests found, but they are frequently destroyed by predators. Some nests are used twice in the same season. The birds arrive in April and stay, I believe, until November or December. Spring migration: April 15, 1952 (singing); April 23, 1951, several singing; April 26, 1953, 3 or 4 singing. Nesting: May 20, 1951, nest; May 26, 1957, five eggs; May 30, 1956, eggs; June 4, 1951, two eggs; June 28, 1953, one nest with small young, another with young ready to fledge. Fall migration: Sept. 13, 1950, one.

GOLDEN-CROWNED KINGLET *Regulus satrapa* Lichtenstein. Usually observed in pairs in April and believed to nest. Migrate south about October. Spring migration: April 9, 1955, one; April 26, 1952, two. Summer record: July 12, 1954, two.

RUBY-CROWNED KINGLET *Regulus calendula* (Linnaeus). Believed to arrive as mated pairs in April, and to nest in the vicinity. Spring migration: April 13, 1956, one pair; April 13, 1957, one pair.

WATER (= AMERICAN) PIPIT *Anthus spinoletta* (Linnaeus). Seldom identified (12 +, on May 3, 1953 and six on Oct. 6, 1957), but probably passage migrants go through each spring. Fifty, May 15, 1958.

BOHEMIAN WAXWING *Bombycilla garrula* (Linnaeus). Groups of a dozen or so move about the country during winter, but retreat when temperatures fall below zero. A flock of 50-100 occasionally seen in early spring, or fall. Winter records: Oct. 10, 1953, 100 seen; Oct. 13, 1947, a flock; Oct., 1946, a flock; Nov. 7, 1948, three; Dec. 10, 1951, twelve; Dec. 11, 1949, eleven; Jan. 28, 1952, twelve; Feb. 14, 1954, fourteen; March 24, 1956, sixty. Summer record: June 9, 1947, several.

CEDAR WAXWING *Bombycilla cedrorum* Vieillot. Positively identified only in summer (May 28, 1954, and June 13, 1956; two

in each case). A nest was found with young July 20, 1957.

NORTHERN SHRIKE *Lanius excubitor* Linnaeus. Rare transient. Observations of single birds on April 3, 1949, and April 14, 1957. This species was reported a number of times in the winter at Chezacut and was believed to feed on chickadees (S: entry for Feb. 17-19, 1939).

EUROPEAN STARLING *Sturnus vulgaris* Linnaeus. One of the first two records of this species in British Columbia was of two birds seen in Bella Coola, 80 miles west-northwest of Kleena Kleene in March, 1947. Another was found dead at Bella Coola in December, 1948 (National Museum of Canada No. 33406). These records are reported in Godfrey (1949).

Jobin (1952) reported the first nesting record for British Columbia at Onward Ranch, near 150 Mile House, Cariboo Highway, in 1948, but thought he had seen starlings near there in the previous three seasons.

Racey (1950) states that J. C. Shelford's first records were near Francois Lake October to December, 1949. Indeed one specimen was collected at Ootsa Lake in November, 1949, and sent to the Department of Zoology at the University of British Columbia (U.B.C., No. 2227). Shelford believes however that he saw starlings as early as the fall of 1947 (in letter to M. T. Myres).

Evidently by late 1949 starlings had passed through the central regions of British Columbia, in small numbers. Their subsequent increase as a breeding species in the Cariboo District and through the Okanagan is reported in Myres (1958), who mentions that H. B. Hammer saw starlings in small numbers once more at Bella Coola in the winters of 1952-55. Jobin (1952) took specimens at Williams Lake in November 1948, and April 1951.

My own first observation of the starling was not until 1951. Two were seen in a field with two Brewer's Blackbirds that spring. On October 21, 1951, a starling was brought to me alive. It had been caught in a dwelling house. This bird is now No. 1313 in the Jobin Collection at Kelowna, B.C. (Myres, 1958). In the next year Andy Christensen of Anahim Lake Ranch identified a starling from bird books.

No more starlings were reported until 1955. Then a pair raised four young in a woodpecker hole at the farm of Tom Chignell, five miles west of Tatla Lake, and a

bird which (when described) appears to have been a starling was found in a chicken house at Brink's farm. A pair was reported by Tom Chignell to be nesting, in 1955, at the approach to the bridge over the Chilcotin River at Hanceville, and Mr. Chignell also knew of two or three other nest locations.

In 1956 six starlings appeared at Chignell's and two nests were found. A nest was also found at Brink's between the galvanized sheet roof and the dirt roof of an old-style log house. On May 31 the young were vocal and three starlings were later banded there. Reports of starlings also reached me from the West Branch of the Homathko River (Lee Butler). M. T. Myres (personal communication) states that he saw four starlings feeding on the road near Chilanko Forks on May 26, 1956.

In 1957 and 1958, there were three, and four, pairs of starlings respectively at Tom Chignell's farm. A pair raised young at Dowling's Ranch in 1957. Shillaker (in a letter) has not yet observed a starling at Chezacut. Chignell saw three flocks of 100 starlings in October, 1958, and three, Nov. 2.

WARBLING VIREO *Vireo gilvus* (Vieillot). Seen, and heard singing, June 4 and 9, 1958. On June 9 a nest was found being built; the female was incubating June 17.

ORANGE-CROWNED WARBLER *Vermivora celata* (Say). Observations on May 21, 1956, and in June and July, 1958.

YELLOW WARBLER *Dendroica petechia* (Linnaeus). Observations on May 25, 1958, June 14, 1956, June 16, 1958 and July 3, 1948, of single birds.

MYRTLE WARBLER *Dendroica coronata* (Linnaeus). One observation: Several, April 21, 1947.

AUDUBON'S WARBLER *Dendroica auduboni* (Townsend). Passage migrants arrive late April, and are at first quite numerous. After a few weeks they become much less noticeable. Believed to breed in the region. Spring migration: April 19, 1952, one male; April 23, 1954, one; April 27, 1949, some; April 27, 1953, one singing; May 2, 1948, some; May 3, 1951, one.

NORTHERN WATERTHRUSH *Soiurus noveboracensis* (Gmelin). Seen, and heard singing, on May 25, 1958, and seen June 16. The line over the eye and heavily streaked underparts were noted.

MAGILLIVRAY'S WARBLER *Oporornis tolmiei* (Townsend). Singing on June 2 and 6, 1958.

YELLOWTHROAT *Geothlypis trichas* (Linnaeus). Observations on June 6, 1958, June 14, 1957, and July 25, 1949, of single males. A fledgling was seen on July 21, 1957.

WILSON'S (PILEOLATED) WARBLER *Wilsonia pusilla* (Wilson). Seen May 18, and singing June 2, and 9, 1958.

AMERICAN REDSTART *Setophaga ruticilla* (Linnaeus). Rare. Observations of single males on June 10, 1957; June 13 and 30, 1958, July 12, 1948 and July 20, 1954.

HOUSE SPARROW *Passer domesticus* (Linnaeus). Not recorded at Kleena Kleene, but they have been seen at Tatla Lake, and I have seen them at Alexis Creek. Shillaker (in a letter) states that they are at Alexis Creek "and now at Redstone and some stay the year around." In 1955 one was seen at Chezacut. It was collected, and is the only record for Chezacut.

WESTERN MEADOWLARK *Sturnella neglecta* Audubon. Probably present each spring and summer, but only observed on one or two occasions: April 9, 1950, one.

YELLOW-HEADED BLACKBIRD *Xanthocephalus xanthocephalus* (Bonaparte). May constitute up to 5 percent of large mixed flocks of blackbirds during the spring migration in April. No nests found. Observed on April 26, 1949, five.

Shillaker (S), observed these birds at Chezacut: June 12, 1939, four; May 12, 1940, one; June 2, 1940, two pairs; and states (entry for July 14, 1940) that it may breed at Maxwell's Lake. Shillaker (in a letter) reports them breeding near Redstone and Chezacut, and at a lake four miles up Alexis Creek.

RED-WINGED BLACKBIRD *Agelaius phoeniceus* (Linnaeus). Quite plentiful, arriving with Brewer's Blackbirds about the end of March. Breeds. Spring migration: March 23, 1950, one; April 6, 1956, one. Nesting: June 13, 1957, a fledgling observed.

BULLOCK'S ORIOLE *Icterus bullockii* (Swainson). Seldom observed. March 8, 1948, a female; June 5, 1949, one pair.

BREWER'S BLACKBIRD *Euphagus cyanocephalus* (Wagler). Flocks of 100-200 arrive on passage in April. The bird breeds in the vicinity and is quite abundant. At Chezacut Shillaker (in a letter) finds nests on the ground at the base of *Betula glandulosa* and occasionally in the open. Spring migration: March 6, 1948, some arrived and then departed; March 25, 1953, some seen; May 6, 1951, hundreds present. Summer records:

July 4, 1948, about thirty, young being fed by their parents. Fall migration: Oct. 27, 1947, several.

COWBIRD *Molothrus ater* (Boddaert). Common summer visitor, presumed to breed. Much commoner in June and July than in May (S).

WESTERN Tanager *Piranga ludoviciana* (Wilson). Rare, probably nests here. Summer records: June 6, 1948, one pair; June 13, 1948, one male; June 14, 1958, one male; June 16 and 17, 1956, one pair; June 19, 1949, one seen; June 22, 1953, one male; June 30, 1956, one male attacking a young jay; July 13 and 31, 1953, one male.

CASSIN'S FINCH *Carpodacus cassinii* Baird. Occasional: June 2, 1953, two; June 25, 1947, some; May 28, 1954, four.

PINE GROSBEAK *Pinicola enucleator* (Linnaeus). Small bands move through the region in winter. Winter records: Oct. 29, 1950, three; Nov. 30, 1950, twelve; Jan. 1956, twelve; apparently spending the winter here.

ROSY FINCH *Leucosticte tephrocotis* (Swainson). Spring migration: April 22, 1948, thirty; April 25, 1954, one male. A big migration from April 7 to 17 (3000 on April 13) and smaller numbers, April 27 to May 1, 1958. Fall migration: Oct. 19, 1947, 60 seen; Oct. 29, 1950, seven; Nov. 6, 1958, twelve; Nov. 10, 1958, ten.

COMMON REDPOLL *Acanthis flammea* (Linnaeus). Found in winter feeding in alders along lake shores. Winter records: Jan. 9, 1949, ten; Feb. 25, 1954, some; March 20, 1949, 100 +; March 24, 1956, twelve; April 7, 1958, twenty.

SLATE-COLORED JUNCO *Junco hyemalis* (Linnaeus). Two, April 7, 1958, in company with Oregon Juncos.

OREGON JUNCOS *Junco oreganus* (Townsend). Flocks of 10-30 arrive in late March. Breeds in area. Spring migration: March 20, 1951; March 25, 1948. Nesting: May 4, 1947, eggs; June 9, 1957, fledgling; June 17, 1951, fledgling; June, 17, 1956, fledgling. Fall migration: Oct. 18, 1947, some seen.

CHIPPING SPARROW *Spizella passerina* (Bechstein). Summer visitor, which nests. Arrives later than White-crowned Sparrow. Spring migration: May 10, 1947, one; May 10, 1957, one. Nesting: June 16, 1957, singing; June 19, 1949, fledgling; July 1, 1957, nest with four eggs; July 16, 1956, fledglings.

WHITE-CROWNED SPARROW *Zonotrichia leucophrys* (Forster). Chiefly a passage migrant. This species evidently nests at

Chezacut in scrub birch *Betula glandulosa* (S.). Spring migration: April 25, 1953, some; April 26, 1951, some; April 29, 1956, some. Summer records: June 9, 1957, singing; June 24, 1956, three. A nest in 1958.

GOLDEN-CROWNED SPARROW *Zonotrichia atricapilla* (Gmelin). Passage migrant: April 22, 1956, some; April 25, 1953, some; April 26, 1951, some. Shillaker (in a letter) reports them breeding at Chezacut. They follow the White-crowns by about a week in the spring migration there.

SONG SPARROW *Melospiza melodia* (Wilson). Summer visitant: April 10, 1956, some, July 6, 1956, four.

SNOW BUNTING *Plectrophenax nivalis* (Linnaeus). Transient: March 28, 1954, forty seen on cattle feeding ground. At Chezacut (S) these birds were around in some numbers in Feb. and March, 1939 (a flock of 90), and in the winter of 1939-40 (100 on March 7, 1940). Arrival dates in the fall at Chezacut (S) were Nov. 4, 1939, and Oct. 24, 1940.

Received for publication 12 May 1958

REFERENCES

- GODFREY, W. E. 1949. European Starling reaches the Pacific coast. *Can. Field Nat.* 63:165.
- JOBIN, L. 1952. The European Starling in central British Columbia. *Condor* 54: 318.
- MUNRO, J. A. 1945. The birds of the Cariboo parklands, British Columbia. *Can. J. Res.*, D 23: 17-103.
- MUNRO, J. A., and I. McT. COWAN. 1947. A review of the bird fauna of British Columbia. *Spec. Publ. B.C. prov. Mus.* 2.
- MYRES, M. T. 1958. The European Starling in British Columbia: 1947-1957. *Occ. Pap. B.C. prov. Mus.* 11.
- RACEY, K. 1933. White Pelican (*Pelecanus erythrorhynchos*) in British Columbia. *Auk* 50: 205.
- RACEY, K. 1950. Status of the European Starling in British Columbia. *Murrelet* 31: 30-31.

BIRDS OF THE MOUTH OF THE ANDERSON RIVER AND LIVERPOOL BAY, NORTHWEST TERRITORIES

E. OTTO HÖHN

Department of Physiology and Pharmacology
University of Alberta, Edmonton, Alberta

INTRODUCTION

THIS PAPER is based on field observations and collecting about the mouth of the Anderson River and on the Cape Bathurst Peninsula from July 1 to August 25, 1955. The project was supported by a grant from the Banting Fund, allocated by the Arctic Institute of North America. During part of my stay, Dr. J. R. Mackay, assisted by J. Stathers, was working in this area for the Geographical Branch, Department of Mines and Technical Surveys. Data from Dr. Mackay's bird observations are included in the systematic list below and a summary of the bird sightings made by Mackay and Stathers during a motor canoe journey up the Anderson River in August is included as an appendix.

The inhabitants of the native settlement of Stanton had moved to Tuktoyaktuk in the spring of 1955. This made it impossible for me to hire a native with canoe and outboard motor as I had planned and it restricted my movements. The areas actually traversed on foot or by boat are shown on sketch map Figure 1. My home was a cabin (former home of the manager of a government-owned reindeer herd, which has since been moved elsewhere)

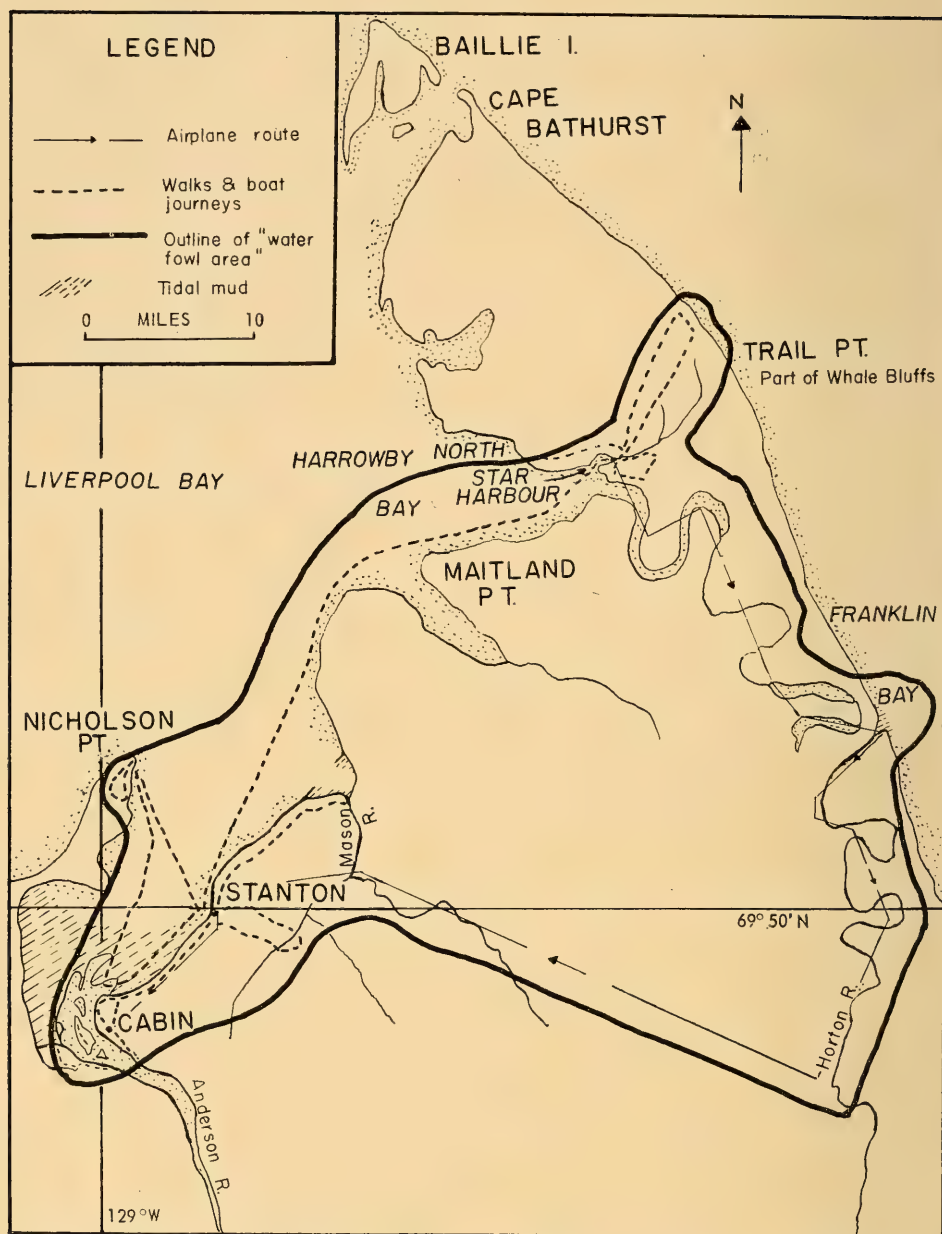


FIGURE 1. Sketch map of the mouth of the Anderson and Liverpool Bay showing routes of walks and boat journeys and of the low-level flight from Harrowby Bay to the mouth of the Anderson on July 26, 1955. The broad solid line outlines the area for which estimates of breeding population of waterfowl are given in the systematic list.

at the mouth of the Anderson. On the day following my arrival I met T. Lassard, a white trapper from the upper Anderson, who was on his way to Aklavik. His boat engine was unserviceable and I suggested he might get it repaired at the construction camp, of which he was unaware, on Nicholson Peninsula. We launched a motor lifeboat belonging to the deserted Roman Catholic Mission at Stanton and we crossed to the north end of Nicholson Peninsula on July 7. I was able to observe here for two and a half hours while the engine repair was completed.

After our return to the mouth of the Anderson on the same day, Lassard was able to continue his journey. He left a 'ratting' canoe for my use which enabled me to visit the islands in the mouth of the river and its western shore. On July 12, I walked to Stanton and from there to the mouth of the Mason River on July 15. On the 16th, I returned to Stanton. On the 17th Mackay's motor schooner anchored at Stanton; he gave me passage to Harrowby Bay where we arrived on July 19. My base here was the deserted tent of the eskimo half-breed, James Wolki, in North Star Harbour. I crossed the Cape Bathurst Peninsula to Trail Point on July 20, returning to the base next day.

On July 26 I was taken back to the mouth of the Anderson by a plane (ordered by radio from the transmitter on Mackay's schooner). The flight was made at low level, about 200 feet, over the course of the creek which enters the apex of Harrowby Bay to the mouth of the Horton River and over the lowermost twenty miles of the course of this river. From here a direct route to the mouth of the Anderson was taken, at a higher altitude (see sketch map, Figure 1). During the low-level flight, I watched carefully for possible Slaty-backed Gulls and Ross's Geese, but although related large birds were readily identified, I saw no birds of these two species. The remainder of my time in the area was spent about the mouth of the Anderson, with three more visits to Stanton. The birds collected are now at the National Museum of Canada where their subspecific identity was established by Mr. W. Earl Godfrey.

TOPOGRAPHY AND AVIFAUNA OF THE 'DRYAS TUNDRA' AND 'WILLOW TUNDRA' SECTIONS OF THE AREA

In vegetation and in avian and mammalian fauna the more northern sections of the area differed from the remaining more southern portions. These differences were also noticed in other parts of the western arctic and justify a subdivision of the tundra life zone into a southern 'willow tundra' and a more northern 'dryas tundra'; still more northern and correspondingly more barren areas may constitute yet a third subzone. The distinctions of the avifaunae of these two subzones, in the area under consideration, are set out in Table 1.

Dryas Tundra

On Nicholson and Cape Bathurst peninsulas, the country is rolling; hills are about 180 feet high. The Cape Bathurst peninsula shows a general slope from Harrowby Bay where the coast is only 15 to 20 feet high to the Amundsen Gulf side where, at Trail Point, it consists of near vertical mud cliffs about 300 feet high. Large patches of mud devoid of vegetation were

TABLE 1. CHARACTERISTICS OF THE SUMMER BIRD POPULATION OF THE 'DRYAS TUNDRA' AND 'WILLOW TUNDRA' SUBZONES OF LIVERPOOL BAY AND THE MOUTH OF THE ANDERSON RIVER

Dryas Tundra

Species confined to this zone:

Common Eider
Baird's Sandpiper
Buff-breasted Sandpiper
Sanderling
Sabine's Gull
Snowy Owl
Snow Bunting

Species strikingly more abundant in this than in the Willow Tundra zone:

Rock Ptarmigan
Whimbrel
Long-tailed Jaeger
Horned Lark

A number of other species are common to both types of tundra.

Willow Tundra

Species confined to this zone, which appears to mark their northern breeding limit:

American Widgeon
Green-winged Teal
Greater Scaup
White-winged Scoter
Red-breasted Merganser
Common Snipe
Lesser Yellow Legs
Least Sandpiper
Hudsonian Godwit
Yellow Warbler
Rusty Blackbird
Tree Sparrow
White-crowned Sparrow
Fox Sparrow

Strikingly more abundant in this than in the Dryas Tundra zone:
Willow Ptarmigan



FIGURE 2. Dryas tundra on the Cape Bathurst Peninsula.



FIGURE 3. Willow scrub and aquatic vegetation along a stream a few miles north of Stanton, in a willow tundra area.

frequent; the dominant plant of dry areas here was *Dryas integrifolia* (Figure 2). The wide but shallow valleys were marshy and carried short grasses, sedges and arctic cotton grass. Willows were seen only near Harrowby Bay where none were over one and a half feet high. From plants collected at Harrowby Bay in late July the following were identified (by Dr. E. H. Moss, Department of Botany, University of Alberta): *Dryas integrifolia*, *Cassiope tetragona*, *Pedicularis* sp., *Polemonium* sp., *Papaver* sp., *Saxifraga hirculus*, *Lychnis apetala*, *Stellaria* sp. Polygon formation was obvious not only in the marshy valleys but also on the uplands.

Willow Tundra

This comprised the remainder of the area from the mouth of the Mason River south to the country on both sides of the mouth of the Anderson. This country is also rolling with hills up to about 300 feet high. Lakes are very numerous. Dwarf birch, not noticed at all in the 'Dryas Tundra' occurred as large mats. Along the many small water courses dense willow thickets, with willows in some places ten feet high and lush vegetation of marsh plants (Figure 3), were found. Polygon formation was obvious only in the marshy depressions.

The coast line consists of mud or clay cliffs of varying height up to about 200 feet. Coastal erosion was evident. In some places melting of previously

frozen mud resulted in a continual trickle of soil from the mud cliffs to the beach below. In an area about half a mile long between the mouth of the Mason and Stanton, erosion has created gullies and towerlike isolated masses of soil making the terrain reminiscent of the badlands of southern Alberta. It is of interest that a Rock Wren (a bird characteristic of the badlands) was seen in this eroded coastal area on July 15. No rocks apart from very few small glacial boulders were seen in either the dryas or willow tundra sections. Rock, however, is close to the surface at the most western projection of land from the east bank of the mouth of the Anderson where the beach consists of a heavy black sedimentary rock. From plants collected near Stanton the following were identified: *Ledum palustre* (not noticed in the dryas tundra areas), *Stellaria* sp., *Epilobium latifolium*, *Castilleja* sp., *Lupinus* sp., *Arnica* sp., *Senecio lugens*, *Empetrum nigrum*, *Arctostaphylos rubra*, *Taraxicum officinale*.

The moose *Alces americana* and muskrat *Ondatra zibethica* reach their northern limits in the willow tundra; both were seen northward up to a few miles inland from Stanton in mid-August.

PREVIOUS ORNITHOLOGICAL WORK

Richardson, who first explored this region in 1826 and again in 1848, makes occasional references to birds in the account of his travels (Richardson, 1829, 1851). Roderick MacFarlane of the Hudson's Bay Company founded Fort Anderson on the Anderson River in 1861 at a point about eighty miles in a straight line from the mouth of the river. In the years 1862-1865 inclusive he made summer collecting trips from the Fort, which was well within the tree line, to the southern extremity of Franklin Bay. His work beyond the tree line was therefore east and somewhat south of the area I covered in 1955, but MacFarlane also received eggs and some birds from the Liverpool Bay Eskimos. He published a paper on the ornithology of the Fort Anderson area in 1891 and in a later paper (MacFarlane, 1908) again refers frequently to the birds of this area. The New England whaler H. H. Bodfish wintered at Langton Bay in 1897-1898 and at Baillie Islands in 1898-1901. His biography (Bodfish, 1936) contains some observations on birds. R. M. Anderson (1913), in his brief account of the natural history observations of the 1908-1912 Canadian Arctic expedition gives a number of ornithological records for the Cape Bathurst area made in 1912. Porsild's (1943) paper on the birds of the Mackenzie Delta contains two records from localities in the area considered in this report. On July 27, 1949, J. D. Soper of the Canadian Wildlife Service carried out an aerial waterfowl breeding census of the area from the base of Nicholson Peninsula and Stanton up the Anderson River to its junction with the Wolverine and Cornwath Rivers. The results of this census were made available to me by Mr. W. Mair, Chief, Canadian Wildlife Service. In August 1949, during a twenty-four-hour visit to Nicholson Peninsula and the mouth of the Anderson I was able to make a few observations. In the systematic list below, references are made to material from all these sources. In the case of MacFarlane's work, only observations referring to areas beyond the tree line are considered.

On comparing the local avifauna of 90 years ago, as described by MacFarlane, with that of the present, the most obvious differences are the disappearance

of the Eskimo Curlew and Smith's Longspur, both of which were abundant breeders in the 1860's. The case of the Eskimo Curlew needs no comment but it appears that Smith's Longspur also has become considerably rarer than formerly in western Arctic Canada. The only recent record for this region is the sighting of a single bird on Richard's Island in 1942 by C. H. D. Clarke (quoted by Porsild, 1943).

Differences between the present avifauna and that of the 1860's

Comparison of McFarlane's ornithological findings in the 1860's with my own in 1955 seems to reflect the climatic improvement generally believed to have taken place in arctic areas. Evidence of climatic change in this particular area is furnished by the fact that Richardson (1829) recorded the tree line as crossing the east channel of the MacKenzie Delta at 68°40' in 1826 whereas recent maps show it about fifteen miles north of this position.

Two types of change, attributable to a climatic improvement, are evident from a comparison of the avifauna of the 1860's with that of the present. Certain high arctic forms which formerly nested in the area no longer do so. These are: Yellow-billed Loon, Ruddy Turnstone, Black-bellied Plover, White-rumped Sandpiper, Sanderling, Red Phalarope, and Pomarine Jaeger. There is a 1912 breeding record for the Jaeger from Baillie Island but because of its exposed position this island may well be more 'high arctic' in character than the rest of the area under consideration.

A number of species which MacFarlane did not find beyond the tree line are now found well beyond it. They are: Mallard, Red-breasted Merganser, Peregrine Falcon (MacFarlane believed its breeding limit to be 68° N, whereas it now nests northward to southern Banks Island at about latitude 72° N), Willow Ptarmigan (which MacFarlane records as abundant up to the tree line but uncommon on the barrens), Lesser Yellow-legs, Yellow Warbler, Rusty Blackbird, Tree and White-crowned Sparrow.

SYSTEMATIC LIST

In this list species not observed in 1955 are shown in square brackets. All dates given without the year refer to observations made in 1955. Observations, unless otherwise indicated, are those of the author; J. R. Mackay's sightings are indicated by the initials J.R.M. Estimates of breeding populations are for the area outlined on the sketch map (Figure 1). Observations on bird behavior made in this area in 1955 have been published elsewhere (Höhn, 1958b).

COMMON LOON *Gavia immer*. Apparently only an infrequent and probably nonbreeding visitor to the area. One was seen at the mouth of North Star Harbour, Harrowby Bay, on July 26. J.R.M. saw another at about the same time on upper Harrowby Bay. Anderson (1913) reports that he was shown the head of one killed at the mouth of the Horton River about 1910 by Fritz Wolki, the only one Wolki had seen in several years of hunting in that region. MacFarlane (1908) records that Fort Anderson furnished eggs of nine nests of this

species in the 1860's and adds that it was abundant on the shores of Franklin Bay. This latter statement seems highly improbable and may be based on confusion with the Arctic Loon.

YELLOW-BILLED LOON *Gavia adamsii*. J.R.M. saw one on the upper reaches of Harrowby Bay on July 20. MacFarlane (1908), however, records it as very numerous on the shores of Liverpool and Franklin bays where several were shot and where he presumed it nested though no nests were found in spite of efforts to do so.

ARCTIC LOON *Gavia arctica pacifica*. Well distributed from the mouth of the Anderson to the mouth of the Mason River, being seen on almost every lake in this area. A pair was also seen on Nicholson Peninsula. On the Cape Bathurst Peninsula, July 18-26, I saw only one but this was probably due to the fact that few sizeable lakes were encountered in the areas covered. On July 16, a pair with two downy youngsters was seen on a lake near the mouth of the Mason River. One of the young was collected and judged to be only one or two days old. Anderson (1913) records nests with fresh eggs near Cape Bathurst on June 22 and 28, 1912. MacFarlane (1891) found it the most abundant loon; 165 nests were found south and north of the tree line along the Anderson River and the coast.

RED-THROATED LOON *Gavia stellata*. This loon was well distributed throughout the area. On July 15, a group of four was engaged in vigorous courtship at sea near the mouth of the Mason River. On July 23, a nest with two well-incubated eggs was found in a lakelet about 20 yards long near North Star Harbour. Anderson (1913) reports nests with fresh eggs near Cape Bathurst, June 22 and 28, 1912. MacFarlane (1891) reports 40 nests found in the Anderson River area but considers it the least numerous loon. On August 24 at the mouth of the Anderson I noticed single birds flying upstream about five times as frequently as I saw birds flying down river. This suggested the beginning of emigration from the area, perhaps of non-breeding individuals. An adult female was taken in a fish net but not preserved.

[**WHITE PELICAN** *Pelecanus erythrorhynchos*]. There are two records of pelicans straggling as far as the Arctic coast on Liverpool Bay, one taken by Eskimos in June or July 1900 (Fleming, 1906, quoted from Preble, 1908) and one reported by Anderson (1913) killed about 1903-1907, which was seen by F. Wolki, who reported it to Anderson. It is quite possible that both records refer to the same individual.

WHISTLING SWAN *Olor columbianus*. Common in the area from the mouth of the Anderson to the mouth of the Mason rivers. I saw only one on the Cape Bathurst Peninsula, July 18-26, but the area covered had only a few large lakes. On July 26 on a low-level flight over the creek draining into Harrowby Bay and the lower 20 miles of the Horton River, 6 pairs, some of them

with young, were seen. On July 2, a nest with 3 well-incubated eggs was found among scrub willow in a small lagoon at the mouth of the Anderson River. The nest was a heap of peat, about a foot high, the cup lined with dead grass and a few downy feathers. Several birds were seen at some distance on nests on the flat islands in the mouth of the Anderson River on July 19; and one on July 19, at the mouth of the Mason River. A pair encountered on a lakelet half way between my cabin and Stanton on August 5, were apparently in molt as they walked ashore and towards the next lake at my approach. Many molted swan feathers were found about this time on the islands in the mouth of the Anderson. An adult with 3 downy young was seen on August 7. J.R.M. during his canoe trip up the Anderson River August 3 to 13, found swans with young, only in the lowermost 12 miles of the river. Breeding is therefore apparently restricted to its lower course; none of the swans encountered was able to fly till August 12. By late August about 100 had gathered, probably in readiness for emigration, at the mouth of the Anderson River. Soper (1949) counted 98 in his aerial census but I saw approximately 200 on a low-level flight over the mouth of the Anderson on August 1, 1949. The population for the area of the lower Anderson River and Liverpool Bay may be estimated at 300-400. F. Jacobson informed J.R.M. that these swans arrive at the mouth of the Anderson about May 13 (before the Snow Geese) and that they reach Maitland Point as early as April 25 in some years and that some stay in the river mouth in the fall until the new ice forms.

WHITE-FRONTED GOOSE *Anser albifrons frontalis*. It is clear from the aerial surveys of Smith and Sutton for several years up to 1953 (Smith and Sutton, 1954) that White-fronted Geese nest regularly, though in fluctuating numbers, in both the upland and coastal tundras between the Mackenzie and the Anderson Rivers. Our observations in 1955 indicate they also nest in the tundra to the east of Liverpool Bay and along the lower Anderson River. MacFarlane (1891) in the 1860's secured about 100 nests; they were found both within and beyond the tree line as far as the lower Anderson and the coasts of Franklin Bay. His remarks under Ross' Goose imply that White-fronts migrated past Fort Anderson in the spring.

Migration: Black Brants appear to reach their western Arctic breeding grounds by a coastwise migration from the west. Snow Geese, to some extent, and Canada Geese approach the coast along certain major riparian flyways but then fan out from the river mouths along the coastal shore leads. In contrast, White-fronts, according to our own observations, the implied observation of spring migrants at Fort Anderson and those of Scott on the Perry River (Scott, 1951); reach their breeding grounds by a fairly direct approach south to north or north-east along rivers entering the Arctic Ocean. In the lower Anderson there are apparently local molt migrations into the delta of the river but the final fall migration appears to be again upriver without marked coastwise travel. The fact that this species nests on only those Arctic Islands, Victoria and King William, which can be reached from the mainland by a minimal sea crossing, is probably related to this migration habit.

Observations: Two flying along the coast between the cabin and Stanton on July 4. On July 16, a pair at the mouth of the Mason River. None were seen at the mouth of the Anderson River till the evening of August 6 when their calls were heard. On the 7th I encamped on the west shore of the river and several flocks, generally of about 20 birds came flying downstream. The call was noted as "kr lik" or "lili lik" and "krouck." This downriver movement continued intermittently all the next day until about 400 had congregated in the area. The remains of an adult, probably killed by a wild predator, were collected that day. A few hundred White-fronted Geese remained about the mouth of the Anderson River until August 18, when a northwesterly storm raised the water levels so that the flat islands in the mouth of the river and the low west bank were under water. This forcible displacement seems to have caused an early emigration from the area. After the storm I saw only one pair of White-fronts among a flock of Brants. On a walk inland from Stanton on August 17, I came across 4 to 6 adults with several groups of 8 to 10 young, on a small lake. Many droppings on the shore indicated that the birds had been here for some time and had no doubt nested in the immediate vicinity. One of the young was still in gray down and the rest were fully feathered but did not fly. Some miles away a similar group of adults and young was seen on another

larger lake on the same day. A bird of the year was collected.

Snow Goose *Chen hyperborea hyperborea* or *C. caerulescens hyperborea*.

Breeding Distribution: This snow goose nests in some numbers on Banks Island (Manning and others, 1956; McEwen, 1958). In the Mackenzie Delta it nests off northern Richard's Island (Porsild, 1943), Kendall Island is said to hold a breeding colony of about 3000 birds (oral communication, 1955, of observations made in 1943 by Twomey) and as appear from the data of Smith and Sutton (1954) it also breeds in other areas north and south of the Eskimo Lakes. East of the Mackenzie Delta proper, Snow Geese have long been known to nest (from native reports) in the mouth of the Anderson River and adjacent Liverpool Bay (MacFarlane, 1891) and on the Cape Bathurst Peninsula (Anderson, 1913). Eastward from there MacFarlane found none to the northeast of Fort Anderson up to and along Franklin Bay; however, they probably nest on the Cape Parry Peninsula and to some extent along minor rivers in Darnley Bay.

Earlier records of Greater Snow Geese (*Chen hyperborea nivalis*) in the present Mackenzie District, N.W.T., given by MacFarlane (1891, 1908) and Preble (1908) must be discarded in view of the present state of knowledge of its summer range.

Wintering grounds and spring migration: It is reasonable to take banding recoveries of Banks Island Snow Geese as applicable in a general sense to the breeding population of the western Canadian Arctic. Twelve banding returns of Banks Island Snow Geese are given in Manning and others (1956). To these the following returns of geese banded July 13, 1953, on Southwestern Banks Island received since the report cited above was published should be added: Oct. 16-Jan. 10, 1954, Lassen County, California; Sept. 7-Oct. 17, 1955, Daysland, Alberta; Dec. 21, 1955, Gustine, California; Sept. (no date), 1956, Castor, Alberta; Oct. 25, 1956, Sweet Home, Oregon; Jan. 9, 1958, Gridley, California. All band returns were from geese shot. These 17 banding returns are supplemented by sightings of dye-marked geese wintering in California (Kozlik, F. M., color-marking White Geese. Dept. of Fish and Game, California, mimeographed and circulars), in southwestern Banks Island and the mainland areas of the Mackenzie District. Full evaluation of all relevant banding returns would

probably be premature but is unlikely to alter the conclusion that Snow Geese nesting in this general area winter mainly in California and in spring migrate (within Canadian territory) through Alberta, and to a lesser extent Saskatchewan and the Athabasca-Slave River and Mackenzie Valley. Those nesting in the mouth of the Anderson River may to some extent follow this river in the spring (MacFarlane, 1891, remarks under Ross's Goose, and Anderson, 1913) but the observations below also suggest an approach to the mouth of the Anderson from the Mackenzie following shore leads.

In 1949 I collected the following information on the spring passage of geese at Kittigazuit, ("Kitti," at the mouth of the east channel of the Mackenzie) from the officer commanding the R.C.A.F. station then maintained there: Snow Geese and Black Brants (some of both species were shot by station personnel) passed here in an east to north-east direction from the last week of May to the last week of June with a peak during the first two weeks of June. Geese would rest on low islands in the channel from early morning till about 4 p.m. local time and then until 7 p.m. fly in pairs or flocks of up to 200 birds to the extremity of the east bank of the channel, though some cut eastwards across the peninsula on which "Kitti" stands, at a point two miles south of the station. The two species were represented in the ratio of 100 Snow Geese to one Brant. The Brants traveled in pairs or groups of not more than four, almost always in company with some Snow Geese. A summary of observations by Miss D. L. Robinson, school teacher at Tuktoyaktuk, twenty miles east of "Kitti" on the coast, for the period August 1947-October 1949 made available to me, reports a spring passage past this settlement of Snow Geese, White-fronts and Brant, mid-May to the end of the first week in June, which greatly exceeded the numbers of migrating geese seen here in the fall (see also Porsild, 1943).

The other approach down the Anderson to its delta and to eastern Liverpool Bay, emphasized by Anderson (1913), is probably a route towards southwestern Banks Island. Many geese using it stop to nest, particularly in late springs, in the Anderson delta and along the east shores of Liverpool Bay including the Cape Bathurst Peninsula.

Yet another spring migration route for Lesser Snow Geese directed towards south-

western Banks Island reaches the mainland coast in Darnley Bay and probably passes along the Cape Parry Peninsula. This is indicated by information given to me orally by Oblate missionaries who have spent some years at the Roman Catholic mission at Paulatuk. They report a regular local spring migration stop-over of "thousands" of Snow Geese. The overland flight to Darnley Bay is probably from the Slave River delta over the north arm of Great Slave Lake and over the chain of lakes thence towards Great Bear Lake, over the Horton River, finally crossing the high ground linking the Smoking and Melville "mountains" over the Hornaday River to its mouth near Paulatuk. These admittedly still somewhat conjectural routes are shown on sketch map Figure 4, which also indicates two likely routes from the south to the upper Anderson, one leaving the Mackenzie about Fort Good Hope, the other from the north shores of Great Bear Lake over a chain of large lakes towards the junction of the Cornwath and Anderson rivers.

It is realized that inland lakes except at the mouths of rivers from the south, at the Slave River delta, for example, will be frozen at the time of the Lesser Snow Goose migration in spring. But such lakes probably serve as flyway landmarks. The later migrating Ross's Goose has been observed along part of this conjectural route (Höhn and Robinson, 1951, and oral reports from Mr. W. Macdonald of Yellowknife).

Fall migration: Probably because the fall migration takes place over seas and inland waters which are then open, local flyways are more diffuse and a further complexity is introduced by the earlier departure of non-breeding subadults (which molt earlier and hence probably migrate southward earlier than adults). The following unpublished personal observations made in 1949 are relevant. August 17, while traveling by boat in Kugmallit Bay (east of northern Richard's Island), I saw two flocks of Snow Geese, each of about 30 birds, passing on a westerly course at 3 p.m. local time. August 24, at Kidluit Bay, I saw a flock of 50 Snow Geese flying south over the land about 5 p.m. A local native told me that on the preceding day similar flocks had been passing over on the same course all day. In 1955 J.R.M. saw flocks of 20 to 50 flying southwest at intervals of about one hour at Warren Point,

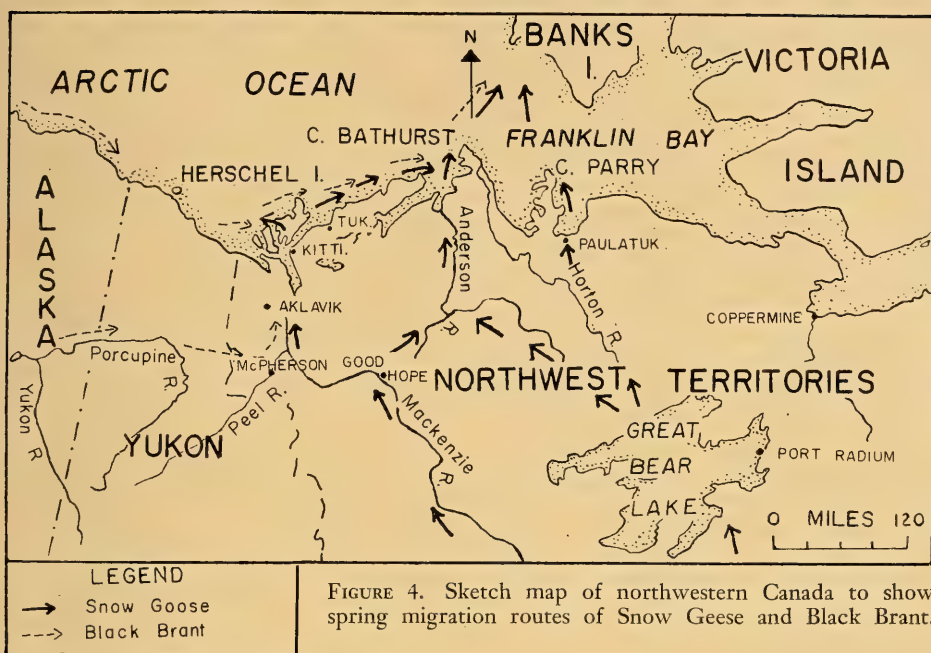


FIGURE 4. Sketch map of northwestern Canada to show spring migration routes of Snow Geese and Black Brant.

August 27; and several flocks of 50 to 100 flying south over Cape Dalhousie, August 22.

On August 19, J.R.M. noted flocks of 5 to 20 passing Nicholson Peninsula; some flocks alighted and then took off again. He estimated a total of 300 to 500. Owing to unsettled weather, the direction of this flight to and from the peninsula was uncertain. One flock was seen coming in from the northeast. On August 21, J.R.M. noted the passage of further flocks of Snow Geese here in flocks of 50 to 100, the day's total being several hundred. It is likely that most of the geese seen at Nicholson Peninsula on August 19 were from the mouth of the Anderson, displaced by flooding of their haunts by the storm of August 18.

Observations: Throughout my stay, there were about 400 Snow Geese on the islands in the mouth of the Anderson River and the low-lying west bank of the river, but after the storm of August 18 there were only 60 to 100 left. The only other places where I saw Snow Geese on the ground were at the mouth of the Mason River (a pair July 15) and two groups of 2 and 3 in the creek entering Harrowby Bay seen from the plane July 26. The first young were seen on July 8 when a group of adults with downies were

swimming from the east shore of the river, where no doubt they had nested, to one of the islands in the river mouth. By August 13, both adults and young were able to fly. On August 8 I found a group of 20 empty nests still containing shell fragments and nest down on a hummock of raised ground covered mainly with dwarf birch, in the marshy grassland of the west bank of the Anderson River. A flock of about 20 was seen flying southwards over a locality some 5 miles inland from Stanton on August 16. On August 23 I encountered 7 birds of the year unattended by any adults at the mouth of the Anderson; 25 adults were seen flying southwards on the same day. Soper (1949) counted 250. The breeding population for the Anderson River and Liverpool Bay is estimated at 500. Anderson (1913) records taking fresh sets of eggs on the Cape Bathurst Peninsula on June 8, 1912. Two birds of the year were collected.

[Ross's Goose *Chen rossii*. The main flyline of this goose is almost certainly northeastward from the Peace-Athabasca delta and over Fort Chipewyan towards the only known breeding ground on the Perry River. There is, however, strong evidence that some migrate on a much more westerly route to

breeding grounds yet unknown to the west of the Perry River. The Banks Land Eskimo half-breed, Fred Carpenter, informed me of the existence of such a breeding colony on the mainland coast (in conversation, 1956). Since earlier reports of this and other natives on the geese of Banks Island were substantially confirmed by Manning and others (1956), this report is likely to be correct. Earlier and recent information on Ross Geese in the western portion of the MacKenzie district may be summarized in approximate chronological order as follows.

A male was shot at Fort Anderson, May 25, 1865, where this was the least abundant goose during the spring migration (MacFarlane, 1891). The statement implies that it was a regular spring migrant here in the 1860's. Anderson (1913) reports one shot 15 miles east of Cape Bathurst in 1912 and that F. Wolki informed him that in some seasons he had killed a number at the mouth of the Horton River. F. Carpenter has told me that small flocks of Ross's Geese are usually found in spring at the mouth of the Anderson. In June 1955 while at "Tuk" I was informed of the sighting by natives of a yellow-dyed and a red-dyed "Wavey" at Toker Point in May of that year. The first bird must have been of this species (Kozlik). In 1953 a single Ross's Goose was found and banded among a flock of molting Snow Geese in southeastern Banks Island by Höhn (Manning and others, 1956). On June 7, 1955, 8 yellow-dyed Ross's Geese were seen flying over Hay River (Kozlik) and the male of a pair was shot in the presence of Höhn on May 22, 1949, in Slave River Delta (see Höhn and Robinson, 1951). The last two reports may represent birds aiming toward the known Perry River nesting grounds along a route from Hay Lakes, Great Slave Lake and Back River to Perry River. The other reports above, to which must be added the sight records of odd Ross's Geese along the chain of lakes from the north arm of Great Slave Lake to Great Bear Lake (W. Macdonald, in conversation, 1953) point to a second flyway apparently aimed towards the area mouth of Anderson—Cape Bathurst. It is to be noted also that the number of Ross's Geese found in the summer of 1949 at the Perry River (Hanson and others, 1956) do not account for the probable total species population or even that part of it which migrates through the settled portions of Alberta (in

May 1955 I saw at least 1000 at Sullivan Lake). However, in July and August 1955, none were seen in the area mouth of Anderson to Harrowby Bay and its creek or the lower twenty miles of the Horton River.

CANADA GOOSE *Branta canadensis*. This species is apparently restricted to an area along the Anderson River somewhat upstream from its mouth where it breeds, as I saw none in the areas personally covered. J.R.M. saw about 50 adults and young of the year on the Anderson River 15 miles upstream from the mouth on August 3; about 25 adults and young 112 miles up the river on August 8 and a smaller number when descending the river on August 10 about 128 miles from the mouth. J. D. Soper, on his aerial census on July 27, 1949, saw only 12.

Those seen by J.R.M. all seemed to belong to one of the larger forms of this species but the subspecies which breeds along the Anderson is still unknown. MacFarlane's record (1891) of 50 nests of the "smaller Canada Goose" (then called *B. c. butchinsi*) said to have been collected on the lower Anderson "and the shores and islands of the Arctic sea" is likely to refer in fact to clutches of Black Brant eggs brought in by natives. However, he also reports one "*butchinsi*" shot from a tree nest.

BLACK BRANT *Branta bernicla nigricans*. Throughout my stay there were 200-400 on the flat islands in the mouth of the Anderson. Elsewhere only one pair was seen at the mouth of the Mason River and one pair halfway between this point and Stanton. On July 3 a nest with eggs was seen on an islet about 6 yards long in a small lagoon on the east bank of the mouth of the Anderson. The remains of about 6 nests were found on North Flat Island on August 3. The first downy young were seen on July 7 at the mouth of Anderson River and on July 15 a pair with three downy young was encountered on the beach between the mouth of the Mason River and Stanton. Soper (1949) counted 3,300 in his census but this number no doubt included young; I would estimate the breeding population of the area at about 1000. Breeding is probably restricted to the mouth of the Anderson River and its islands, the coast about the mouth of the Mason River and the Cape Bathurst area. I saw none on a low level flight over the creek entering Harrowby Bay or the lower 20 miles of the Horton River on July 26. MacFarlane (1891) reports it as abundant on

Liverpool Bay but comparatively rare on Franklin Bay. He did not observe it at Fort Anderson on the spring and fall migrations. This is to be expected as the migration of this species probably follows the coast in an easterly direction in the spring from northern Alaska.

However, Richardson (1851) points out that on their spring migration, Black Brants heading for Canadian breeding grounds avoid the long detour around northern Alaska by following the valley of the Yukon eastward to the Peel River and thence over the Mackenzie Delta. In 1949, I found that this goose is known to the MacPherson Loucheux Indians by a specific name in their language; they also refer to it as the "husky goose." It is also known to the Old Crow Loucheux (Irving, 1958). Hence the route suggested by Richardson is apparently still followed.

Richardson saw flocks migrating westward August 11, 1848, at Cape Bathurst (Richardson, 1851). Anderson (1913) found it nesting commonly on the Cape Bathurst Peninsula (probably in 1912) and Bodfish (1936) mentions the taking of many eggs on Baillie Islands and adjacent areas about the turn of the century. Four adults were collected.

MALLARD *Anas platyrhynchos*. Probably nests in small numbers as far north as the mouth of the Anderson. I saw two on July 1 near the cabin; one near Stanton on July 30 and about 50 on one of the islands in the Anderson River mouth on August 13. MacFarlane (1891) apparently did not see it beyond the tree line in the 1860's nor did Anderson (1913).

PINTAIL *Anas acuta*. This species probably nests in small numbers throughout the area (MacFarlane, 1891). Small numbers were seen in the mouth of the Anderson River throughout my stay. On July 26 one was collected out of a flock of 15 at North Star Harbour, Harrowby Bay. On August 7, six large flocks totaling about 400 birds were flying upriver over the islands in the mouth of the Anderson, almost certainly beginning their southward migration. Anderson (1913) records molting females unable to fly, on June 28, 1912, at Cape Bathurst while the males were flying about in flocks. An adult male was collected but not preserved.

AMERICAN WIDGEON *Mareca americana*. Seen only on the flat islands in the mouth of the Anderson where it may breed. About 12

were seen here on August 7 and about 50 over one island on August 13. Anderson (1913) records that F. Wolki informed him that he had once or twice shot American Widgeons at the mouth of the Horton River.

GREEN-WINGED TEAL *Anas carolinensis*. A few were seen at the mouth of the Anderson on August 23. Apparently it did not range beyond the tree line in the 1860's (MacFarlane, 1891), but Bodfish (1936) states that he shot teal (this species, it may be presumed) at Langton Bay, June 4, 1898.

GREATER SCAUP *Nyroca marila*. Fairly common along all coastal areas covered. Females with downy young were seen as follows: one with 6 young, July 29, on a lakelet east of the mouth of the Anderson; one with an unrecorded number of young halfway between the cabin and Stanton, August 5; and two each with two young on the west bank of the Anderson, August 8. MacFarlane (1891) does not list this species, but only the Lesser Scaup *Nyroca affinis* from areas within the tree line. An adult female Greater Scaup was collected and the skull preserved.

OLDSQUAW *Clangula hyemalis*. By far the most abundant duck in the district, found in all areas visited but not on lakes more than a mile inland. The following figures may be cited to indicate its numbers. On a boat journey from Stanton to northwest Nicholson Peninsula on July 7, about 100 were seen. About the same number were seen in the mouth of the Mason River on July 15; some of these were still showing courtship activities including the characteristic spring call. On a schooner journey from Stanton to Harrowby Bay on July 18, about 100 were seen. On the portion of Harrowby Bay that I covered on foot (about 6 miles) there were about 400. J.R.M. saw a flock of at least 1000 at the Nicholson Peninsula Sandspit August 21. The summer population of the whole area may be estimated at 1000-1500. A female with 8 downy young was seen on a lake at the mouth of the Mason River on July 16. Bodfish (1936) saw one as late as November 16, 1898, at Baillie Islands. An adult female was collected at Tuktoyaktuk.

COMMON EIDER *Somateria mollissima v-nigra*. Three on Harrowby Bay on July 18 and on July 23 a flock of 30 flying up North Star Harbour. J.R.M. saw 50-100 in northwestern Harrowby Bay on July 25, over some 100 miles south of Cape Bathurst, and about 100 on the Cape Bathurst Sandspit on

July 28; all these were predominantly males. Richardson (1851) reports huge flocks here August 11, 1848. Anderson (1913) mentions a breeding colony at the Horton River sand-spit. MacFarlane (1891) reports breeding in immense numbers on Franklin Bay and eggs found by Eskimos in Liverpool Bay on sandy islets. He records a Snowy Owl eating the eggs of a Common Eider. He also remarks that females always exceeded males in Franklin Bay. In view of J.R.M.'s observations, in 1955 it is probable that summering males were out at sea or on sandspits and therefore missed by MacFarlane whose trips covered only the shores of the apex of Franklin Bay.

KING EIDER *Somateria spectabilis*. A flock of nine females was seen on one of the islands in the mouth of the Anderson on July 9, one specimen of which was collected. Its ovaries showed little sign of activity and this as well as the others in the flock were probably non-breeding birds. Anderson (1913) described the westward fall migration of this species past Cape Bathurst in 1912. The movement involved mainly males and began as early as June 30 and included by mid-July many Common Eiders as well. Soper (1949) lists 18 in his census of the lower Anderson. MacFarlane (1891) found it nesting in some numbers on Franklin Bay in the 1860's, and states that about 20 nests from Liverpool Bay were brought in by natives. Richardson 1828 reports "king ducks" at Trail Point July 19, 1826. Some indication of spring arrival is given by Bodfish's note of 3 shot on May 20, 1901, at Baillie Islands.

WHITE-WINGED SCOTER *Melanitta deglandi*. On July 3, three in the mouth of the Anderson River. On July 29 I saw a female with 7 downy young on a lakelet near the mouth of the Anderson. On August 17, two females were seen with a total of 12 downy young, inland from Stanton. MacFarlane (1891) reports a few nests on the lower Anderson River in the 1860's but apparently all within the tree line except for some found in the barrens east of the fort. Bodfish (1936) saw one (recorded as a white-wing coot) as late as November 16, 1898, at Baillie Islands.

SURF SCOTER *Melanitta perspicillata*. One in Harrowby Bay on July 24 where J.R.M. also saw one on July 20. MacFarlane (1891) apparently found it nesting in this general area mainly up to the tree line.

RED-BREASTED MERGANSER *Mergus serrator*. On July 5, a string of ten of these mergansers of both sexes was flying northward offshore from Stanton, possibly still on their northward migration. Others were seen in small numbers in Harrowby Bay, the mouth of the Mason River and the mouth of the Anderson. A female with four downies was seen on a lakelet halfway between the cabin and Stanton on August 5. MacFarlane (1891) reports nesting only up to the tree line. Soper (1949) saw 4 on his aerial census of the lower Anderson.

ROUGH-LEGGED HAWK *Buteo lagopus s. johannis*. Single birds were fairly frequently encountered along the coast between the cabin and Stanton. On July 19, an empty nest of the species, identified by several feathers in it, was found on a pinnacle of the clay cliffs at Trail Point. One on Harrowby Bay on July 20 and 24. A pair seen a little inland from Stanton, on August 15 indicated by their anxious behavior that they had young close by. MacFarlane (1891) reports 70 nests collected in the 1860's, 55 being built on trees and 15 on cliffs. Some of these at least presumably were north of the tree line.

GOLDEN EAGLE *Aquila chrysaetos*. Single birds, adults or immatures were seen fairly regularly in all parts of the area covered except Nicholson Peninsula, which I visited only once in 1955 and where I saw one on August 1, 1949. J.R.M. saw one at Big Baillie Island July 27. A large nest of sticks was found on the bare clay slopes of a bluff at the mouth of the Anderson River on August 2. Apparently it had not been used in 1955, though from its size it must have been used for many years before that. Mr. M. McNab told me in 1949 (Höhn and Robinson, 1951) that he believed a pair regularly nested there. J.R.M. found a nest on August 13 well up the Anderson River. Golden Eagles were most often seen flying low over escarpments on coastal slopes where there were burrows of Arctic ground squirrels *Citellus parryi* and though I never saw a kill, (McFarlane, 1891, reports seeing one) these probably formed the main food of Golden Eagles in this area. MacFarlane (1891) also lists mice and lemmings as dietary items. J.R.M. on August 5, some way up the Anderson, saw one knock down a White-fronted Goose from among several which had just taken off. The eagle did not follow up the wounded bird but later made another attack and finally

alighted among some other geese on the bank. These geese walked right past the eagle with apparently no concern for its presence. On August 12 the same observer saw an eagle diving at, but not touching, the heads of several Whistling Swans on the Anderson River. Anderson (1913) reports a nest on a steep bluff on the banks of the Horton River about 14 miles south of Langton Bay. MacFarlane (1891) records 12 clutches of eggs taken from 1861 to 1865 inclusive, along the Anderson River and from near the mouth of the Horton River. Ten were on cliffs (mostly earth cliffs) and two in tall spruce.

BALD EAGLE *Haliaeetus leucocephalus*. One at the mouth of the Anderson River on July 8, and one over the Flat Islands in the mouth of the river on the 9th. MacFarlane (1908) records several nests on the Lockhart and upper Anderson Rivers but believed it did not nest north of Fort Anderson.

GYRFALCON *Falco rusticolus*. Single birds or two together were seen frequently in the area at the mouth of Anderson River to Stanton. Probably only one pair nested in the areas I covered. One was seen over the north end of Nicholson Peninsula on July 7. All birds seen were of the gray phase. MacFarlane (1908) found it common in the wooded districts of the upper Anderson and records finding over 20 nests in the Fort Anderson district in the 1860's.

PEREGRINE FALCON *Falco peregrinus anatum*. Single birds seen frequently about the cabin. On July 15, one at the mouth of the Mason River. On July 24, I saw a male carrying prey in its talons as it flew along the clay cliffs at Trail Point where it probably had a nest; another was seen at North Star Harbour on July 24. A nest with two downy youngsters was found on a ledge on the bank of the Anderson River mouth on August 2. The adult male and one of the young were collected. The crop of the adult contained the remains of a Pectoral Sandpiper. MacFarlane (1891) found nests only to the south of Fort Anderson and doubts that it nested in the 1860's beyond 68°N.

PIGEON HAWK *Falco columbarius bendirei*. On August 20 one near the cabin at the mouth of the Anderson River. On the 23rd I collected an immature female at the same place; crop and gizzard contained the remains of 2 Lapland Longspurs. Another was seen on the 24th and 25th. J.R.M. saw two adults feeding two full-grown young on the upper Anderson on August 13. MacFarlane

(1908) states that it ranges along the Anderson River to near the Arctic coast of Liverpool Bay. The area of my observations would appear to be just beyond its breeding range.

MARSH HAWK *Circus cyaneus hudsonius*. Single birds were seen as follows: July 14 north of Stanton; July 15 near the mouth of the Mason River; July 19 on Harrowby Bay. MacFarlane (1891) records two nests on the lower Anderson River.

WILLOW PTARMIGAN *Lagopus lagopus albus*. Numerous in the area at the mouth of the Anderson to the mouth of the Mason rivers and on Harrowby Bay. None were seen on my one day visit to Nicholson Peninsula. About the mouth of the Anderson River, I estimated the population as at least 20 per square mile. Two nests were found near the cabin at the mouth of the Anderson River, on July 1. One held 8 eggs just about to hatch. In the second, a few days off hatching, I failed to record the number of eggs. A hen with downy young was also seen on the same day. Young just able to fly were first seen on July 27. By August 11 when the young were flying well, the hens would take off on disturbance without feigning injury leaving the young to their own devices. Small groups of cocks, which until then had always been encountered with the females with young, were now found. On July 24, a covey of 40, all adults, was seen on Wolki's Inlet on Harrowby Bay, presumably these were nonbreeding birds. Fred Jacobson, a former resident on the mouth of the Anderson, reported to J.R.M. that he used to kill 400-500 ptarmigan here (this species as well as Rock Ptarmigan) in one week. He believed these to be fall migrants from Banks Island. The observations of Manning and others (1956) on Banks Island indicate that such emigrations from this island to the mainland actually take place. MacFarlane (1891) found it exceedingly abundant in the 1860's about Fort Anderson but uncommon on the barrens where it was replaced by the Rock Ptarmigan. This is clearly not the case at present. The Rock Ptarmigan now predominates only on the more exposed peninsulas. Eight adults were collected.

ROCK PTARMIGAN *Lagopus mutus rupestris*. Common on the Nicholson Peninsula where 8 pairs were encountered in 2½ hours' walking on July 7 and also on the Cape Bathurst Peninsula. Elsewhere only a few. Downy young were seen (one collected) on July 7

and also near Harrowby Bay on July 24 and 26. In two places remains of Rock Ptarmigan were found on knolls used as lookout posts by Snowy Owls. Four adults were collected.

LITTLE BROWN CRANE *Grus canadensis canadensis*. Three near the mouth of the Mason River on July 15. On August 17 a pair a few miles inland from Stanton. They showed considerable anxiety and no doubt had young close by. MacFarlane (1891) found a nest on Franklin Bay and reports one found by natives in Liverpool Bay in the 1860's.

[**WHOOPIING CRANE** *Grus americana*.] MacFarlane (1891) states that a few flocks were annually seen flying past Fort Anderson (in the 1860's) in the spring and autumn but no nests were found. Mr. M. McNab reported to Höhn in 1949 that the natives had seen two large white cranes with black wings on an island about 12 miles up the Anderson from its mouth.

SEMPALMATED PLOVER *Charadrius semipalmatus*. A few pairs were found throughout my stay along the coast from the mouth of the Anderson River to Stanton. Downy young were seen here from July 8 to July 28. MacFarlane (1891) found it common on Franklin Bay. Three adults were collected at Aklavik.

GOLDEN PLOVER *Pluvialis dominica dominica*. Pairs apparently breeding were found in all parts of the area covered. Flocks were encountered only on July 20 on the Cape Bathurst Peninsula when I found two of 20-30 in six hours of walking. J. R. M. saw a flock of 6 July 21 on the Smoking Mountains and one of at least 50 at Big Baillie Island July 27.

[**BLACK-BELLIED PLOVER** *Squatarola squatarola*.] Anderson (1913) reports that he found this species nesting near Cape Bathurst. MacFarlane (1891) found it nesting on Franklin Bay, but none were brought in from the lower Anderson or Liverpool Bay by the natives.

[**RUDDY TURNSTONE** *Arenaria interpres morinella*.] Seen by Anderson (1913) at Cape Bathurst in the spring, but he states that none remained to breed. Clarke, however, saw young just able to fly here on August 17, 1942 (Porsild, 1943). MacFarlane (1891) saw two migrants in June, 1864, at Fort Anderson. Eggs were brought to him from Liverpool Bay and the lower Anderson and Franklin Bay but he did not find any nests himself (MacFarlane, 1908) on his trips to Franklin Bay.

COMMON SNIFE *Capella gallinago delicata*. Single birds at the mouth of the Anderson River on July 8 and 30. On August 7, several small flocks were seen flying down river on the west shore of the mouth of the Anderson. They had probably nested some little way up river. One inland from Stanton on August 17.

WHIMBREL *Numenius phaeopus budsonicus*. At the mouth of the Anderson River single birds were seen on July 1 and 3 and two on August 20. On the Cape Bathurst Peninsula it was more numerous; about fifty were seen in two flocks on July 19 and 20 in the course of 6 hours' walking. J. R. M. saw 5 pairs at Cape Bathurst, July 25. MacFarlane (1908) did not see Whimbrel in the Fort Anderson to Franklin Bay area but reports nests brought in by Eskimos from areas to the west of the lower Anderson.

[**ESKIMO CURLEW** *Numenius borealis*.] MacFarlane (1891) found it breeding abundantly in the barrens east of Fort Anderson, thirty sets of eggs being taken in the 1860's.

LESSER YELLOWLEGS *Totanus flavipes*. On July 29 a pair on a small lake inland from the mouth of the Anderson River. They showed great anxiety and eventually I came across two young already able to fly. A single bird August 8 near the cabin. J. R. M. saw some on July 21 on the Smoking Mountains, northwest from Harrowby Bay, and on Big Baillie Island on July 27. MacFarlane (1891) appears to have found it only within the tree line.

PECTORAL SANDPIPER *Erolia melanotos*. A few were encountered in all areas visited. Some of these seen on the Cape Bathurst Peninsula, July 18-26, behaved as if they had young. Anderson (1913) records it as abundant in the Cape Bathurst region but does not state whether nests were found. MacFarlane (1891) found no nests but records a few seen near Fort Anderson. A male with incubation patches was collected at Tuktoyaktuk, an immature male was taken at the mouth of the Anderson.

[**WHITE-RUMPED SANDPIPER** *Erolia fuscicollis*.] MacFarlane (1891) found several nests on Franklin Bay in the 1860's. It is unlikely that it nests so far southward at present.

BAIRD'S SANDPIPER *Erolia bairdii*. Two seen near Trail Point, Cape Bathurst Peninsula, on July 20, behaved as if they had young. This is confirmed by the finding of incubation patches on the male collected. MacFarlane (1891) reports several nests in the

barrens of the Anderson River region but found the bird uncommon.

STILT SANDPIPER *Micropalama himantopus*. On July 2 and 3 six adults with several downy young at the mouth of the Anderson River. Another adult with a downy was seen a few miles further south on July 8. Single birds were also seen on July 23 and 24 on the Cape Bathurst Peninsula and one near Stanton on August 15. MacFarlane (1891) reports finding nests with eggs on Franklin Bay but found it very rare in the interior. An adult and a downy were collected.

SEMIPALMATED SANDPIPER *Ereunetes pusillus*. Fairly common in all areas visited. On July 9 while I was lying in wait for Black Brant on one of the islands in the mouth of the Anderson River, one was brooding newly hatched young within the reach of my hands. MacFarlane (1891) found eggs on Franklin Bay.

LEAST SANDPIPER *Erolia minutilla*. MacFarlane (1891) found it breeding abundantly about Fort Anderson, on the borders of the barrens and beyond to the shores of Franklin Bay. Several "probables" of this species were seen about the mouth of the Anderson River but the only certain identification was one collected from a group of 10 on July 24 on Harrowby Bay.

BUFF-BREASTED SANDPIPER *Tryngites subruficollis*. A pair on Harrowby Bay on July 23 behaved as if they had young. One on August 22 on one of the islands in the mouth of the Anderson River. Anderson (1913) records two flocks near Cape Bathurst, July 6, 1912, (two collected). MacFarlane (1891) reports it as common on the barrens between the Horton River and Franklin Bay; twenty sets of eggs, of four each, were taken between June 26 and July 9 in the 1860's, probably over several years.

HUDSONIAN GODWIT *Limosa haemastica*. MacFarlane (1891) reports several nests found about Fort Anderson and on the lower Anderson River but found this bird not very common. On August 9 I saw a flock of about 30 flying down river at the mouth of the Anderson, one of which was collected. It proved to be a bird of the year, leaving little doubt that this godwit still nests on the Anderson River. On August 13 four on one of the flat islands in the mouth of the Anderson.

SANDERLING *Crocethia alba*. I saw only 2 or 3 on Nicholson Peninsula on July 7 and

a flock of ten on Harrowby Bay on July 23. Clarke observed some on August 17, 1942, at Cape Bathurst (reported by Porsild, 1943). Anderson (1913) reports it as fairly common on Cape Bathurst in August but not found nesting. MacFarlane (1891) found only one nest with fresh eggs on June 29, 1863, on the barrens 10 miles west of Franklin Bay.

[**RED PHALAROPE** *Phalaropus fulicarius*.] MacFarlane (1891) found it fairly abundant on the shores of Franklin Bay where nests were found in 1864 and 1865. In the western Canadian arctic this species is distinctly more northern in distribution than the Northern Phalarope, thus Porsild (1943) has only one record for the Mackenzie Delta where the Northern Phalarope is a common nester. While on Banks Island (Manning, Höhn and McPherson, 1956) the Red Phalarope was fairly common but no Northern Phalaropes were seen.

NORTHERN PHALAROPE *Lobipes lobatus*. Fairly common in all parts of the area visited. On July 10, a male was seen in charge of a downy young, near the mouth of Anderson River. J. R. M. saw one with 3 downies July 23 at Harrowby Bay. MacFarlane (1891) found it abundant in the wooded country about Fort Anderson and in the barrens on to Franklin Bay but less abundantly here. Many sets of eggs, all of 4 eggs each, were secured by him. An adult male and female, of which the skulls were preserved were taken at Tuktoyaktuk.

[**POMARINE JAEGER** *Stercorarius pomarinus*.] Anderson (1913) took a nest with 2 eggs on Baillie Island, July 3, 1912, and also found it abundant on the west coast of Franklin Bay where he found the ratio of pale- to dark-phased birds about 100 to 1. MacFarlane (1891) did not find it nesting but obtained 3 skins from the area mouth of Anderson—Liverpool Bay from natives and shot one on July 11, 1865, on Franklin Bay.

PARASITIC JAEGER *Stercorarius parasiticus*. Fairly common in all areas visited. I found a downy youngster probably about 10 days old on July 24 on Harrowby Bay. Out of 50 individuals in which the color phase was recorded 30 were of the dark phase, 20 of the light phase. Two instances of obviously paired birds in which each partner was of opposite color phase were encountered. MacFarlane (1891) found several nests between Fort Anderson and Franklin Bay.

LONG-TAILED JAEGER *Stercorarius longicaudus*. Also fairly common in all areas

visited, but more so in the dryas tundra. A downy young was found on Harrowby Bay on July 26. Of twenty in which the color phase was recorded all belonged to the light phase. MacFarlane (1908) reports many nests in early June in the Anderson River valley, in the barrens east of the fort and on the Arctic coast.

GLAUCOUS GULL *Larus hyperboreus barrovianus*. Common, evidence of nesting on Nicholson Peninsula, islands in the mouth of the Anderson River, mouth of Mason River and about North Star Harbour on Harrowby Bay. At Nicholson Peninsula I was told by workers at a construction camp that eggs had been found in June. At the other places downy young were seen, the first on July 23 on Harrowby Bay.

On July 14, near Stanton, a group of 20 were flying low and at times floating about $\frac{1}{4}$ mile from shore over an area in which 3 white whales (*Delphinapterus leucas*) were cruising. Often fish 6-8 inches long were seen to leap from the water, presumably while being hunted by the white whales, and the gulls snatched up many of these. The gulls were obviously taking advantage of the fish forced to the surface by the whales, (see observations of similar avian-pinniped associations observed by Ryder, 1957).

Immatures of this species seem to summer south of the breeding areas as none (other than birds of the year) were seen in this area or in 1953 on Banks Island. Young of the year, able to fly, were first seen on August 20. An abnormally colored individual with black on the tips of several of the largest primaries on both wings was collected from a group of normal Point Barrow Glaucous Gulls which had young about, Aug. 3, on one of the islands in the mouth of the Anderson.

Godfrey's comments on this bird are as follows: "It is the size of *Larus hyperboreus barrovianus* but the primaries are conspicuously marked with gray. The wing markings are too dark, and its pattern is different from *L. glaucoides kumlienii*. Its very pale mantle does not remotely resemble *L. schistisagus*. The bird is what is often called '*L. nelsoni*.' This is currently regarded (A.O.U. Check-list, 1957, p. 647) as a hybrid between *L. hyperboreus* and *L. argentatus vegae*. This concept, however, does not appeal to me for several reasons. Probably '*Larus nelsoni*' is a rare phase of *L. hyperboreus* due to reversion to an ancestral wing pattern."

Five adult males, in addition to the abnormally colored bird, were collected.

[SLATY-BACKED GULL *Larus schistisagus*.] In another publication, Höhn (1958a) has shown that the record of nesting of this gull in Harrowby Bay in 1901 (Bent, 1921) is unlikely.

HERRING GULL *Larus argentatus* or THAYER'S GULL *Larus thayeri*. One near Stanton on July 14 and two on July 30. MacFarlane (1891) found it breeding on the lower Anderson and Horton rivers. It seems likely that both the 1955 and MacFarlane's records refer to Thayer's Gull.

[CALIFORNIA GULL *Larus californicus*.] MacFarlane (1891) reports that specimens with eggs were received (in the 1860's) from the lower Anderson Eskimos and that one or two nests were found near the Fort. Its occurrence so far north seems doubtful, particularly as J. R. M. saw none on his canoe trip up the Anderson, and despite Anderson's (1913) report that it was common in Coronation Gulf where he stated he found it nesting and collected a male.

Godfrey comments: "I share your doubts that *californicus* breeds on the arctic coast. Probably the old breeding records of MacFarlane (1891) and Anderson (1913) refer to *thayeri*. This is understandable for *thayeri* was unknown to science when they wrote. Although I have not seen the particular specimen Anderson (1913) recorded as *californicus* taken on Coronation Gulf on June 10, 1911, I have examined a second-year bird taken by him at the same place on the same date. It had been misidentified as *californicus*. It is *thayeri*."

MEW GULL *Larus canus brachyrhynchus*. Two were seen north of Stanton on July 16, one at the mouth of the Anderson on August 7 and one near Stanton August 15. J. R. M. saw one near Cape Bathurst on July 25. MacFarlane (1891) reports eggs and birds collected at Fort Anderson but gives no indication that any of these came from the Arctic coast. It appears to nest only up to the tree line.

SABINE'S GULL *Xema sabini*. On July 19 about ten in the entrance to Harrowby Bay. Two on the north shore of Harrowby Bay, July 23, and two in the mouth of the Anderson, August 8. J.R.M. saw 10 on the Cape Bathurst sandspit July 28. Anderson (1913) found large numbers nesting on a lake near Cape Bathurst, June 22 and 28, 1912. Small numbers may still nest in the area. MacFar-

lane (1908) reports a few eggs of this gull received from Eskimos of Liverpool Bay and birds and eggs collected on Franklin Bay.

ARCTIC TERN *Sterna paradisaea*. Common throughout the area. A nest with one well-incubated egg (the other eggs had probably been taken by Glaucous Gulls) on an islet, on which a Black Brant also had its nest, at the mouth of the Anderson July 3. By August 3, young able to fly were encountered on islands in the mouth of the Anderson. By August 22 this species had already left the area. Three adult males were collected.

SNOWY OWL *Nyctea scandiaca*. Well distributed in the dryas tundra of the northern section of the area as at Nicholson Peninsula where one was seen July 7 and on the Cape Bathurst Peninsula where 5 were seen simultaneously near the shore of Harrowby Bay on July 26. J.R.M. also felt the species was unusually abundant in this general area in 1955. He noted groups of 5 or more within a few hundred yards of each other. Some idea of its food is furnished by the following observations: remains of a Rock Ptarmigan near place where the Nicholson Peninsula bird was disturbed, two pellets on Harrowby Bay, July 24, containing tundra mouse, two collared lemmings, remains of an Arctic ground squirrel and of a Rock Ptarmigan found on lookout posts of the same pair. MacFarlane (1891) also records a Snowy Owl catching a ground squirrel. He found no nests in the period. 1861-1865 spent at Fort Anderson. Bodfish (1936) reports a nest with one egg, May 20, 1901, near Baillie Islands. He found more nests on June 2 of the same year.

SHORT-EARED OWL *Asio flammeus*. Single birds at mouth of the Anderson River on July 11 and 28. On August 13 one was trapped here but not preserved. One near Stanton on July 13 and 31. MacFarlane reports several nests in the barrens to the east of the area under discussion as well as some to the south within the tree line.

SAY'S PHOEBE *Sayornis saya*. One at Stanton, July 5 and 12, but I was unable to collect it. Not recorded by MacFarlane (1891). Porsild (1943) found a pair nest building at Kittigazuit, Mackenzie Delta, in late May, 1932.

HORNED LARK *Eremophila alpestris boyti*. Decidedly more common in the dryas tundra than in the willow tundra sections of the area. On Nicholson Peninsula young just able

to fly were seen on July 7. They were common on the Cape Bathurst Peninsula. A family was also seen at the mouth of the Mason River July 16 and 17 and at Stanton in August. Mr. Godfrey remarks that three adults collected were badly worn but apparently tend slightly toward the subspecies *articola*. MacFarlane (1891) secured nine nests from natives of the lower Anderson and Liverpool Bay and collected others on Franklin Bay.

COMMON RAVEN *Corvus corax principalis*. Single birds were fairly often seen about the mouth of the Anderson River, never more than one in a day's observations. On August 5, a group of 4, probably a family, was seen about two miles inland, halfway between the cabin and Stanton. MacFarlane (1891) reports it as abundant on the lower Lockhart and Anderson rivers but did not see it on the coast, the nests he found were within the tree line.

SWALLOW *Riparia riparia* or *Petrochelidon pyrrhonota*. A fleeting view of a swallow on July 23, Harrowby Bay. At this latitude it was probably one of the above two species, MacFarlane (1891) found both nesting on the Anderson presumably within the tree line.

ROCK WREN *Salpinctes obsoletus*. One in song seen July 14 a few miles north of Stanton. The following details were noted at the time: bird brown above, paler and gray below, dark streaks on breast, rump reddish brown, upper surface of tail brown with white spots near its extremity, song "tziwi, tziwi, tziwi." This is the first record of this species in the arctic but another occurrence far north of its normal range is reported by Crosby and Beckett (1957) who observed a pair at Churchill, Manitoba, on numerous occasions from late June to early August, 1956.

ROBIN *Turdus migratorius*. An engineer at the camp on Nicholson Peninsula reported seeing one there in early June. The record is probably valid in view of others from localities beyond the tree line: Coronation Gulf, Anderson (1913); Mackenzie Delta, Porsild (1943) and Höhn and Robinson (1951); Bodfish, 1936) reports a male May 26, 1895, at Herschel Island.

WATER PIPIT *Anthus spinoletta rubescens*. Numerous on all coastal bluffs visited on the Cape Bathurst Peninsula and between the mouth of the Anderson and Mason rivers. Young out of the nest seen from July 10 on-

wards. MacFarlane (1891, 1901) merely states that he has reason to believe it is among the birds which summer in the area. One was taken at Tuktoyaktuk.

YELLOW WARBLER *Dendroica petechia*. A few at the mouth of the Anderson and near Stanton, where 3 males and a female were seen on July 13. One as far north as the mouth of the Mason River on July 16. Their habitat was high willow scrub, particularly along stream beds. Slight song was still heard on July 13. This warbler almost certainly nests in the willow tundras of the area. MacFarlane (1908) found it abundant around Fort Anderson but gives no indication that it was found beyond the tree line. However, Anderson (1913) recorded it nesting north to the south end of Richard Island and on the mainland to the east of Richard Island, 25 or 35 miles north of the tree line.

RUSTY BLACKBIRD *Euphagus carolinus*. A juvenile was shot August 5 near the mouth of the Anderson. A family was encountered a few miles inland on the same day, the male already in molt was still singing a little and was collected. Four seen some miles inland from Stanton on August 17. The habitat of all were willow tangles about the outlet of lakes. MacFarlane (1891) does not record it beyond the tree line but Anderson (1913) reports it as common in the Mackenzie delta, "going" some distance north of the northern limit of trees.

COMMON REDPOLL *Acanthis flammea flammea*. Fairly frequent at all times from the mouth of the Anderson to Stanton. MacFarlane (1891) obtained many nests about Fort Anderson. Two adult males were collected.

HOARY REDPOLL *Acanthis hornemanni exilipes*. Several seen about the mouth of the Anderson River. MacFarlane (1891) reports nests in the valley of the Anderson.

SAVANNAH SPARROW *Passerculus sandwichensis anthinus*. Common in the area from the mouth of the Anderson to the mouth of the Mason River. On Harrowby Bay a pair was seen July 20, one was carrying food, presumably for the young. Song had already ceased when I arrived in the area on July 1. MacFarlane (1891) who reports two subspecies (*P.s. savanna* and *P.s. alaudinus*) found it numerous on the Anderson but gives no clear indication of the northern limit of distribution. Two adult females were collected on the Anderson and other adults at Tuktoyaktuk and Aklavik.

TREE SPARROW *Spizella arborea*. Fairly common as far north as a few miles beyond Stanton. The last spring song was heard on July 27 and 28 and the first fall song on August 23. MacFarlane (1891) appears to have found it only within the tree line in the valley of the Anderson. One was collected at Aklavik.

WHITE-CROWNED SPARROW *Zonotrichia leucophrys gambeli*. A pair at Stanton, the young of which were flying, on July 17. Another family at the mouth of the Anderson River on August 23. Last spring song heard July 13, and a snatch of fall song on August 13. MacFarlane (1891) reports it as breeding in great numbers in the wooded sections of the Anderson district. An immature female was collected.

FOX SPARROW *Passerella iliaca*. Seen at Stanton on July 17 and quite frequently about the cabin on the mouth of the Anderson River. MacFarlane (1891) reports a few nests in the barrens.

LAPLAND LONGSPUR *Calcarius lapponicus lapponicus*. Common throughout the area. Young already able to fly seen from July 10 onwards. Spring song had already ceased when I arrived on July 1. A slight subsong was given by two birds of the year collected on August 23.

[SMITH'S LONGSPUR *Calcarius pictus*.] MacFarlane (1891) found it abundant in the barrens of Fort Anderson and on the lower Anderson and took over 150 nests in the general district. It must have become much rarer as neither J.R.M. nor I saw any although keeping a careful lookout for them. A decrease or an eastward shift of the breeding area is also suggested by the fact that MacFarlane (1908) reports it breeding to the west of the Mackenzie delta in 1897; whereas Porsild (1943) did not observe it in that area.

SNOW BUNTING *Plectrophenax nivalis* The only locality where I observed this species was at Trail Point where Richardson (1828), who first described the locality July 18, 1826, also saw some. Here a few pairs probably nested, as a male was seen carrying maggots or small caterpillars in its bill and two females were also about, July 24. J.R.M. saw one feeding young on upper Harrowby Bay on July 22. There are apparently very few nesting localities in this area. Bodfish (1936) gives a spring arrival date for Baillie Islands as April 5, 1901.

APPENDIX

Birds observed by J. R. Mackay and J. Strathers on a canoe journey up the Anderson River to about 150 miles from its mouth, Aug. 3 to 13, 1955.

Upriver Journey, Aug. 3 (mouth of river to 28 miles upstream): Common Loon, 1; Arctic Loon, 1; Whistling Swan, 15 adults, 10 young; White-fronted Goose, 57 adults, 165 young; Canada Goose, 15-20 adults, 20 young; Glaucous Gull, 1; Mew Gull, 1; Arctic Tern, 19; Golden Eagle, 1; Redpolls, 12; Fox Sparrow, Savannah Sparrow, White-crowned Sparrow, Robin, Northern Shrike at 20 miles upstream, 1.

Downriver Journey, Aug. 13 (part of) over same stretch: Unidentified loons, 15; Whistling Swan, 4; White-fronted Goose, 108; Glaucous Gull, 6; Mew Gull, 1 adult, 3 immatures; Arctic Tern, 12; Golden Eagle, 1; Whimbrel, 36.

Upriver Journey, Aug. 4, 28-44 miles upstream: No observations.

Downriver Journey, Aug. 13: Glaucous Gull, 1; Golden Eagle, 5; Pigeon Hawk, 2 adults, 2 young; White-fronted Goose, 20; Red-breasted Merganser, 4 males; Robin, 2 immatures; Varied Thrush, 1; Raven, 4.

Upriver Journey, Aug. 5, 44-63 miles upstream: Common Loon, 3; Arctic Loon, 1; Whistling Swan, 2; White-fronted Goose, 100-150; Mew Gull, 1; Bonaparte's Gull, adult and immature, 10; Golden Eagle, 1; Arctic Tern, 19; Whimbrel, 6; American Widgeon, 75.

Downriver Journey (part of), Aug. 12 and 13: Arctic Loon, 4; Whistling Swan, 4; White-fronted Goose, 44; Glaucous Gull, 3; Mew Gull, 4; Golden Eagle, 6; Arctic Tern, 4.

Upriver Journey, Aug. 6, 64-79 miles upstream: Whistling Swan, 8; White-fronted Goose, 33; Short-billed Gull, 3; Whimbrel, 17; Arctic Tern, 4; Golden Eagle, 1; Rusty Blackbird, 2 adults, 2 young.

Downriver Journey, Aug. 12: Unidentified Loons, 2; Whistling Swan, 4; White-fronted Goose, 7; Short-billed Gull, 2; Whimbrel, 30; Arctic Tern, 4; Golden Eagle, 1.

Upriver Journey, Aug. 7, 80-104 miles upstream: Arctic Loon, 2; Whistling Swan, 2; Mew Gull, 4; Golden Eagle, 6; Arctic Tern, 19; Red-breasted Merganser, 3 adults, 8 young; American Widgeon, 6 adults, 20 young; Golden Eagle, 2; Robin, 3; 1 probable Goshawk.

Downriver Journey, Aug. 11: Northern Shrike, 1; Raven, 4; Pine Grosbeak, 2; Canada Goose, 8.

Upriver Journey, Aug. 8, 104-141 miles upstream: Arctic Loon, 2; Canada Goose, adults and young, 25; Short-billed Gull, 6; Arctic Tern, 3; Golden Eagle, 3; Marsh Hawk, 1; Canada Jay, 1; Green-winged Teal (?), 2; Mallard (?), 5.

Downriver Journey, Aug. 10: Arctic Loon, 2; Unidentified loon, 2; Whistling Swan, 2; Canada Goose, adults and young total, 30; Red-breasted Merganser, 5 adults and 6 young; Mew Gull, 24; Arctic Tern, 3; Golden Eagle, 3; Short-eared Owl, 1; Pigeon Hawk, 1; Unidentified ducks, 18.

Upriver Journey, Aug. 9, 141-150 miles upstream: Canada Jays, 1; Northern Three-toed Woodpecker, 1.

The following points in these observations appear to be particularly noteworthy: Whistling Swans apparently did not nest any distance inland from the mouth of the Anderson, as young birds were not seen beyond 12 miles upstream. The number of swans, White-fronted Geese and Canada Geese showed a decline between the upriver and the downriver journeys during the period Aug. 3 to 12. On the upriver journey a total of 25 swans were seen, on the downriver trip only 18; for White-fronts the totals are 400 (adults and young) and 179; and for Canada Geese 50 (adults and young) and 30. In the case of the swans and the White-fronts the movement was almost certainly towards the mouth of the river since the numbers of both seen there by E.O.H. increased at this period. The Canada Geese probably moved southwards as none were seen at the mouth of the river in July and August by E.O.H. The fairly large number of Golden Eagles is also interesting.

REFERENCES

- AMERICAN ORNITHOLOGISTS' UNION, 1957. Check-list of North American Birds. 5th ed.
- ANDERSON, R. M. 1913. Report on the natural history collections of the expedition. *In* My Life with the Eskimos, by V. S. Stefansson. New York, Macmillan, p. 436-494.
- BENT, A. C. 1921. Life histories of North American Gulls and Terns. Bull. U.S. nat. Mus. 113.
- BODFISH, H. H. 1936. Chasing the bow-head. Cambridge, Harvard Univ. Press.

- CROSBY, J., and E. BECKETT. 1957. Rock Wren at Churchill, Manitoba. *Can. Field Nat.* 71:82-83.
- HANSON, H. C., P. QUENEAU, and P. SCOTT. 1956. The geography, birds and mammals of the Perry River region. *Spec. Publ. Arct. Inst. N. America* 3.
- HÖHN, E. O. 1958a. The supposed occurrence and nesting of the Slaty-backed Gull in the western arctic region of Canada. *Can. Field Nat.* 72:5-6.
- HÖHN, E. O. 1958b. Observations on the behaviour of certain arctic birds. *Arctic* 11:93-101.
- HÖHN, E. O., and D. L. ROBINSON. 1951. Some supplementary bird notes from the general area of the Mackenzie Delta and Great Slave Lake. *Can. Field Nat.* 65: 115-118.
- IRVING, L. 1958. Naming of birds as part of the intellectual culture of Indians at Old Crow, Yukon Territory. *Arctic* 11: 117-122.
- McEWEN, E. H. 1958. Observations on the Lesser Snow Goose Nesting Grounds, Egg River, Banks Island. *Can. Field Nat.* 72: 122-127.
- MACFARLANE, R. 1891. Notes on and list of birds and eggs collected in arctic North America, 1861-1866. *Proc. U.S. nat. Mus.*
- MACFARLANE, R. 1908. List of birds and eggs observed and collected in the Northwest Territories of Canada between 1880 and 1894. *In* *Through the Mackenzie Basin*, by C. Mair. Toronto, Briggs, p. 285-447.
- MANNING, T. H., E. O. HÖHN, and A. H. MACPHERSON. 1956. The birds of Banks Island. *Bull. nat. Mus. Canada* 143.
- PORSILD, A. E. 1943. Birds of the Mackenzie Delta. *Can. Field Nat.* 57:19-35.
- PREBLE, E. A. 1908. A biological investigation of the Athabasca Mackenzie region. *N. Amer. Fauna* 27.
- RICHARDSON, SIR JOHN. 1828. Narrative of a second expedition to the shores of the polar sea in the years 1825, 1826 and 1827. London, Murray.
- RICHARDSON, SIR JOHN. 1851. Arctic Searching Expedition. London, Longman, Brown, Green and Longmans.
- RYDER, R. A. 1957. Avian-pinniped feeding associations. *Condor* 59:68-69.
- SCOTT, P. 1951. Wild geese and Eskimos. London, Country Life.
- SMITH, R. H., and E. L. SUTTON. 1954. Waterfowl breeding ground surveys in northern Alberta, Northwest Territories and Yukon. *Spec. sci. Rep. U.S. Fish Wildl. Serv. Can. Wildl. Serv.* 27.
- SOPER, J. D. 1949. Aerial census of waterfowl of Anderson River. Unpublished report, Canadian Wildlife Service.

Received for publication 9 May 1958

Translations From the Russian

The Canadian Wildlife Service announces the publication of two more titles in the series "Translations of Russian Game Reports":

Volume 5, "Sable and Squirrel, 1951-55"

Volume 6, "Trapping and the Fur Industry, 1951-55"

Each \$1.00, available from the Queen's Printer, Ottawa, Ontario.

OBSERVATIONS ON BIRDS OF THE MACKENZIE KING ESTATE, KINGSMERE, QUEBEC

JOHN W. ARNOLD

64 Powell Avenue, Ottawa 1, Ontario

THIS is a rather extensive postscript to the previously published report of a breeding-bird census carried out in 1952 on a plot of deciduous Gatineau woodland (Arnold, 1953). It presents data for the same plot for the subsequent four years and includes a list of the birds that are known or presumed to nest on the Mackenzie King estate, Moorside, where the plot was located.

The data for the breeding-bird census are given in Table 1. The published data for 1952 are included in the table for comparison. The plot coverage for the years 1953 to 1956 was approximately the same as reported for 1952 and there were no major changes in the condition of the plot.

The data show that the annual total breeding population remained fairly constant, but there was a continual shifting of the species represented. This change in the species complex was undoubtedly due to the relatively small size of the plot rather than to a reflection of a general condition. It will be noted also that the estimated total population for 1952, and particularly the number of breeding pairs of the Least Flycatcher, was lower than in the following years. This is considered to be an incorrect estimate due to inexperience in detecting nests and locating species' territories in this type of woodland, rather than to an actual low population for that year. The total breeding population, which averaged 109 pairs in 100 acres, was considerably lower than that reported for another plot of similar size in the same district (Morland, 1955). However, Morland's plot represented a slightly different habitat in general and included a considerable amount of edge that was apparently attractive to warblers and sparrows.

The following is a list of the birds that nested or were presumed to have nested on or in the immediate vicinity of the estate in the years 1952 to 1956. The species for which nests were observed are indicated by an asterisk. The remainder were seen to occur as pairs during the breeding season. Red-shouldered Hawk, Broad-winged Hawk, Ruffed Grouse, Mourning Dove, Black-billed Cuckoo, Barred Owl, Whip-poor-will, Ruby-throated Hummingbird, Yellow-shafted Flicker, Pileated Woodpecker, Yellow-bellied Sapsucker*, Hairy Woodpecker*, Downy Woodpecker*, Crested Flycatcher*, Eastern Phoebe, Least Flycatcher*, Eastern Wood Pewee, Tree Swallow*, Purple Martin, Blue Jay, American Crow*, Black-capped Chickadee, White-breasted Nuthatch*, Brown Creeper, House Wren, Winter Wren, Catbird, American Robin*, Wood Thrush, Hermit Thrush*, Olive-backed Thrush*, Veery*, Cedar Waxwing, Starling*, Red-eyed Vireo*, Black-throated Blue Warbler, Black-throated Green Warbler, Blackburnian Warbler, Chestnut-sided Warbler, Ovenbird*, Maryland Yellow-throat*, American Redstart, House Sparrow*, Cowbird, Scarlet Tanager*, Rose-breasted Grosbeak*, Indigo

TABLE 1. ESTIMATED NUMBER OF BREEDING BIRDS IN FIFTEEN ACRES OF DECIDUOUS GATINEAU WOODLAND

Species	1952	1953	1954	1955	1956
Yellow-bellied Sapsucker	1 (1)*	1 (1)	0	0	1 (1)
Hairy Woodpecker	1	1 (1)	1 (1)	0	1 (1)
Downy Woodpecker	0	1 (1)	0	1 (1)	1
Least Flycatcher	3 (2)	5 (4)	8 (7)	6 (4)	5 (3)
Eastern Wood Pewee	1	1	0	1	1
White-breasted Nuthatch	0	0	1 (1)	0	0
Hermit Thrush	0	0	1 (1)	1 (1)	1 (1)
Olive-backed Thrush	1 (1)	1	0	1	1
Veery	1	2 (1)	1 (1)	1 (1)	1
Red-eyed Vireo	2 (1)	1 (1)	1 (1)	2 (1)	1
Black-throated Blue Warbler	0	1	0	1	1
Black-throated Green Warbler	0	0	1	0	0
Ovenbird	2	1	1 (1)	2 (1)	2 (1)
Scarlet Tanager	0	1	1 (1)	1	0
Rose-breasted Grosbeak	1	1 (1)	1	1 (1)	1 (1)
Total	13	17	17	18	17

*Figures in parentheses are nests actually located

Bunting, Purple Finch, American Goldfinch, Chipping Sparrow*, White-throated Sparrow, Song Sparrow*.

This list is not presumed to be complete since the estate was not entirely surveyed with a view to establishing nesting records. Mainly the observations were made during the frequent walks from the parking area to and from the census plot which was located about half a mile distant, northwest of the walking trail to the falls. Habitats on the estate are extremely varied, from open fields to small areas of mature conifers, and they presumably support a wider variety of nesting species than are recorded here.

REFERENCES

- ARNOLD, J. W. 1953. Breeding-bird census 1952. *Can. Field Nat.* 67:180-181. MORLAND, T. F. T. 1955. Bird breeding census, 1953. *Can. Field Nat.* 69:25.

Received for publication 17 June 1958

THE BREEDING BIOLOGY OF THE GREATER SNOW GOOSE ON BYLOT ISLAND, NORTHWEST TERRITORIES

LOUIS LEMIEUX

Canadian Wildlife Service, Quebec, Quebec

INTRODUCTION

THE population of the Greater Snow Goose *Chen hyperborea atlantica* increased in number from approximately 4,000 in 1900 to 80,000 in 1957, according to censuses taken in the Cap Tourmente area on the St. Lawrence River 40 miles east of Quebec City. (As discussed later, some Lesser Snow Geese, *C. b. hyperborea*, may mix with the flock.) The increase, while most satisfactory, made it essential for good management to understand better the natural history of the subspecies.

The geese winter along the Atlantic Coast of the United States from New Jersey to North Carolina, where the range is extensive and the food abundant. The flocks stop at Cap Tourmente during spring and autumn migration; there they occupy a very limited area where the food supply (*Scirpus americanus*) might conceivably become a factor limiting the size of the population.

It was desirable to find out the limiting factors on the Arctic nesting grounds, as little was known on the subject. It was my privilege to be sent north in 1957 by the Canadian Wildlife Service for that purpose. Bylot Island was chosen as the site of investigation when it became apparent upon preliminary enquiry that a considerable number of geese nested there.

I left Mont Joli, Quebec, May 18, arrived at Frobisher Bay on the 19th and, after some delay, landed at Pond Inlet on the 27th. I crossed by dog sled to Bylot Island on June 4 and camped for the summer at the mouth of the Aktinequak River (see Figure 1). I returned to Pond Inlet on August 26 and boarded the C.G.S. *C.D. Howe* there on August 29 for the home voyage.

STUDY METHODS

I found two goose colonies not far from my camp site, one with 28 nests, the other with 33. I visited the colonies regularly at intervals of two or three days, numbered the nests, and measured and marked the eggs. Data were recorded for each nest on nest location, egg laying, clutch size, incubation, and hatching. Other colonies were located later, and observations were made of some nests in them as well. After hatching was over, I followed the broods as they spread out overland, and watched their progress and movements until the young reached the flying stage. I explored thoroughly the southwest corner of the island, noting topographical features, vegetation, other goose colonies, etc. Observations were made on the food, feeding habits, behavior, and molt of the geese. Seven hundred and seventy-nine geese were trapped and banded.

TOPOGRAPHY AND CLIMATE

Bylot Island, (73° N 80° W), lies northeast of Baffin Island, from which it is separated on the west by Navy Board Inlet and on the south by Eclipse Sound and Pond Inlet. It is bounded on the north by Lancaster Sound and

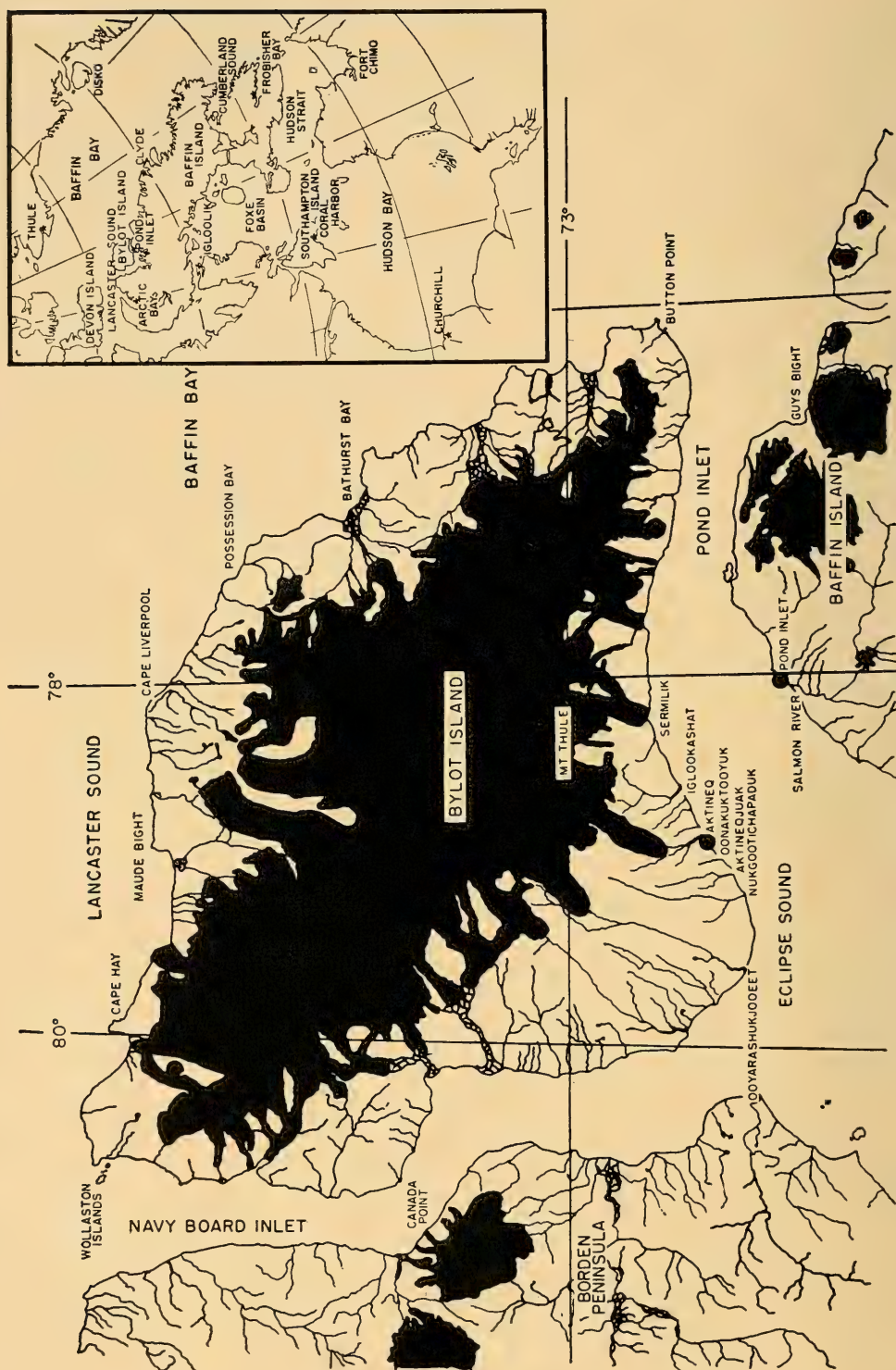


FIGURE 1. Map of Bylot Island and (inset) other islands north of Hudson Bay (reproduced through the courtesy of *Arctic*).

on the east by Baffin Bay. It is roughly rectangular in shape, and at its greatest length and width is approximately 95 miles from east to west and 60 miles from north to south, and has an area of about 4,200 square miles. Most of the island is mountainous and covered by a snow field; the mountains and glaciers extend to the sea except at the northeast and southwest corners of the island, where there are rather extensive lowlands. I spent the summer of 1957 at the southwest corner of the island, which may be further described as follows:

East of the Aktineq River in Eclipse Sound, the mountain range runs inland from the coast northwesterly and falls into the sea just south of Canada Point in Navy Board Inlet. The triangular area between the hills and the west coast, which has a superficies of 500 square miles, is a vast outwash plain cut by rivers and creeks flowing from the glaciers. The plain is elevated above sea level, forming a plateau which can best be described as very gently rolling. The plateau is wet and marshy; much of it is grassy although some high areas are bare and gravelly, probably the result of drainage and exposure to wind. The plain is dotted with small lakes and ponds, all very shallow and generally devoid of aquatic vegetation. There is a drop of up to 200 feet from the plateau to the shore, where the terrain is much rougher; the declivity is deeply cut by the large rivers and to a lesser extent by streams and rivulets, and has been eroded by rain and wind. The slopes of the ravines are usually covered by heath (*Cassiope tetragona*) and willows (*Salix* sp.) mixed with a variety of other flowering plants. Snow accumulates in the gullies but melts rapidly in the spring as the temperature rises. In Eclipse Sound the wind is almost always from the east. The westward slopes of the valleys and ravines, sheltered from the wind, exposed to the afternoon sun, and well protected by the snow cover in winter, support a dense vegetation; but the eastward slopes, of exposed glacial material, are generally barren. In Navy Board Inlet, the wind is mainly from the northwest; its effect on the land is not so apparent and most of the valleys are uniformly covered with vegetation.

Below the main slope from the plateau there are two or three raised beaches of rewashed glacial debris leading to the present seashore which is sandy and gravelly.

Winter was drawing to its end when we arrived at Pond Inlet on May 27. The days were long and the snow was beginning to melt. The sun did not set from early June to late July. There was surprisingly little snow, the average annual snowfall being approximately 30 inches. Ice, however, reportedly forms about six feet thick in the bays and straits. The ice in Eclipse Sound did not break up until the last part of July, and it was August 6 before I could use a small boat.

The temperature was occasionally below freezing in early June, but throughout the summer it averaged on the coast 45°F during the day and 36°F in the evening. Temperatures were sensibly higher inland, away from the chilling influence of the sea ice or water; they sometimes rose to 60°F and once to 65°F.

The sky was generally clear, but twice we had a week of continuous high winds and rain. On the whole, the season was dry, although the inhabitants of Pond Inlet referred to it as unusually wet.

BREEDING BIOLOGY OF THE SNOW GEESSE

Arrival and Nesting

We saw a small group of four geese on May 30, flying eastward along the high cliffs of southeast Bylot Island, headed for Button Point or perhaps the floe edge. The weather was still wintry at that time and snow had hardly begun to melt. On June 2, there arrived at Pond Inlet an Eskimo who had seen Snow Geese at the southwest corner of Bylot. On June 5, I observed about 200 geese behind my camp below the main plateau on the island; from then on, geese could be seen every day. No great flocks were ever seen arriving but the number of geese in the area built up rapidly. Breeding birds were already paired and soon retired from the beaches to the nesting sites. Only nonbreeders remained in flocks which could be seen here and there throughout the summer.

I found the first nests on June 13. The geese breed in ravines at the edge of the plateau and sometimes on rather flat land between hills, generally in colonies ranging from 25 to 300 nests, though a few isolated nests were seen. No nests were found anywhere but on the slope leading to the plateau, between a quarter of a mile and two miles from the seacoast.

Not all the ravines were occupied by nesting geese, and the Eskimos reported that the birds do not necessarily use the same ones year after year. They seem to choose their nesting areas each year, selecting from a vast number of favorable locations scattered between the Aktineq River and Canada Point, a distance of about 60 miles. In 1957, the easternmost breeding colony was situated two miles east of the site of my camp. Eskimos say that the Aktineq River valley is sometimes colonized by geese, but not often. I studied closely a stretch of coastline 15 miles long and found colonies spaced along it at an average interval of one mile.

Along the south shore of Bylot, the geese generally nest on the westward slopes of ravines which, as has been mentioned, are the protected ones and have a good cover of vegetation. The entire slope, from top to bottom, may be utilized. I found nests on the tops of hills or on scree where there was no protection from wind; however, around these sites there was always some vegetation, from which the nest was built. The nest site must be dry. Snow may remain all summer along some of the ridges. The melting snow wets the slopes beneath, and those wet spots are not used for nesting. Geese feed there, however, since the moist earth is easy to dig in. For the colonies located on relatively flat land between hills, good drainage is also a requisite. A few isolated nests and sometimes groups of two to five nests are found occasionally a considerable distance from any colony.

The nest is usually well concealed in a shallow depression. It is built of dry bits of vegetation and lined with down. The vegetation used is that surrounding the nest site; and down is generally plentiful enough for the goose to cover the eggs with it when leaving the nest. The colonies do not consist of close groups of nests; the nests are usually spaced well apart, but the distance between them may depend on the nature of the terrain. On flat land, nests may be as close as 15 to 20 feet from each other. I was unable to observe active nest-building, but it is clear that the nest is completed rapidly, probably overnight. I found nests in locations which had been empty the previous day.

The Eggs

The colony of 28 nests was situated one-and-a-half miles east of camp, the other, with 33, was one mile west of it. Some observations, such as dates of laying and length of incubation period, often could not be made at all of the nests, but the number of samples is indicated with the data.

Egg-laying began about June 8, since some nests found on June 10 already contained two eggs each. I was able to record the date the first egg was laid in 22 nests as follows: June 10, four; June 11, two; June 12, six; June 13, six; June 14, four.

From observation of 22 nests, dates at which the last egg was laid are as follows: June 16, six; June 17, ten; June 18, four; June 20, two.

In the colonies under observation no eggs were laid after June 20. The laying period therefore extends approximately from June 8 to June 20, and reaches its peak between June 12 and June 17.

Eggs are laid at the rate of one per day, except that there is often a lapse of one day after the third egg is laid.

One hundred and twenty-three eggs were measured. The average length was 81.2 mm (range 73.8 mm to 91.4 mm), and average diameter 53.4 mm (range 50.0 mm to 57.4 mm).

One hundred and eighteen nests contained a total of 545 eggs. The average clutch size was thus 4.6 eggs (s.d.: 1.5), and the clutches varied from two to nine eggs.

Early nests usually contain larger clutches than late ones, as seen in Table 1. It may be that late nesters are young birds breeding for the first or second time.

The fate of 253 eggs in 52 nests is presented in Table 2. Of the 52 nests, 13 were deserted, four were completely destroyed by predators and eight had

TABLE 1. SIZE OF CLUTCHES IN RELATION TO DATE OF NESTS

Date first egg laid	Number and size of clutches	Average clutch size
June 10	4(7,6,7,6)	6.5
June 11	2(6,5)	5.5
June 12	6(5,5,5,5,4,5)	4.9
June 13	6(5,3,4,3,4,4)	3.9
June 14	4(4,5,5,2)	4.0

TABLE 2. FATE OF 253 EGGS IN 52 NESTS

Fate	Numbers	Percent
Hatched	147	58.1
Not Hatched:		
Deserted	76	30.0
Destroyed	30	11.9
	— 106	41.9
Total	253	100.0

part of their complement of eggs destroyed. Of the latter, six lost one egg each and two lost three eggs each. Eggs that remained in the eight nests hatched. Eggs noted as destroyed were probably taken by weasels, ravens, jaegers, or other predators, although some may have been accidentally broken by incubating geese. No infertile eggs were noted. Desertion may have been caused in part by my visits to the colonies.

In an attempt to obtain information on egg replacement, I removed from one to three eggs from 10 other nests. The missing eggs were never replaced nor were any identifiable renesting attempts observed.

Incubation and Hatching

Although the adult birds remain on or near the nest during the egg-laying period, incubation presumably begins only after the clutch is complete, since all the eggs in a nest hatch at about the same time. The length of the incubation period is here considered as the period extending from the time the last egg of the clutch is laid to the time that same egg hatches. The length of the incubation period could be ascertained from 18 nests as follows:

<i>Number of Days</i>	<i>Number of Nests</i>
23	8
24	6
25	4

Thus incubation lasts from 23 to 25 days.

It appears that only the female incubates, although I was not able to verify this by marking the birds. Only the females incubate among Lesser Snow Geese (*Chen hyperborea hyperborea*) and Pink-footed Geese (*Anser brachyrhynchus*), and probably the same is true of Greater Snow Geese. I never observed the birds to alternate at the nest. The male stands watch near the nest, always at the same post. As the season advances the droppings accumulate at his post and this has also been noted for Pink-footed Geese by Scott and Fisher (*A Thousand Geese*, 1954). The gander's watchpost may be a few feet away from the nest or close to it.

The geese are territorial, the territory consisting in a very small defended area around the nest. Both birds were observed defending the territory against other geese which penetrated it.

The geese are quite shy of human beings. They generally flew or walked away when we got to within about 200 feet of the nest. Only near the end of the incubation period or during the hatching period did some birds become bolder, keeping close to their nest and hissing at us in a fine display of defensive behavior. They were usually quick to return to their nests after we had departed.

The geese do not move around much during incubation; they feed in the valleys near the nesting sites. They fly hardly at all at that time except when disturbed, and one can seldom see any geese but nonbreeders, except in breeding colonies.

Hatching in 56 nests took place between July 8 and 13 as follows: July 8, two; July 9, 16; July 10, eight; July 11, 16; July 12, 12; July 13, two.

I saw only two unhatched clutches after July 13.

Hatching success was perfect; in the nests seen, all the eggs hatched except those destroyed by predators or deserted.

The Young

As soon as all young are dry, the broods are taken to the main plateau where they gradually spread out, some going far enough inland to reach the foot of the mountains. Approximately a week after the hatching period, the broods are scattered all over the plateau and the ravines are completely deserted. The food of the young geese consists mainly of paludal herbaceous plants on which they browse. They feed very actively almost twenty-four hours a day.

Family ties are very strong and exclusive. I placed among one brood three goslings captured when their parents deserted them during a chase. The foster parents soon moved away to another pond with their own brood, leaving the newcomers behind unattended. Incidentally, the three young birds remained on their pond throughout the season and matured successfully to the flying stage.

In August, when the young geese have attained a good size, the broods start moving back slowly toward the coast. Flocks are formed as broods meet, small at first, but enlarging rapidly as they get closer to the shore. By August 20, huge flocks of geese are seen on the coast all along the southwest corner of Bylot.

THE MOLT

Breeding birds begin to molt soon after the young are hatched, about July 25. On August 16, adult birds were seen flying again for the first time, but some were still flightless on August 25.

In the spring the nonbreeding geese spend their time feeding and resting near the coast or at the edge of the plateau while those breeding are busy nesting. They remain in flocks throughout the summer: flocks of anywhere from 20 to 200 were seen. In July when the snow melts, they begin to go farther inland and frequent the large ponds. On July 14, the first molting subadults were seen, 16 on one pond and 10 on another. There were a few broods on the same ponds. On July 16, a flock of 60 flightless nonbreeders was found. Later we trapped 131 from one large pond. On August 6, we saw the first flying subadults, a flock of 250. The smaller flocks probably group together after the molt is over.

THE FOOD OF THE GEESE

Early in the spring, at the beginning of June, the geese seem to feed mostly on the roots of *Oxytropis maydelliana*. This plant grows in clusters which often stand out through the thin snow cover and are readily spotted. The geese dig the roots out and most clusters showed signs of having been worked over. For the rest of the summer the food of the adult geese is the bulbous root of *Polygonum viviparum* which is very abundant. It grows on all kinds of terrain, dry or wet, gravelly, sandy or humic. It is specially common on wet slopes, growing through the moss cover. The root is easily dug out of such ground and the geese feed intensively on it, especially in areas close to the nesting sites. On well-utilized slopes, the moss may be seen pulled out and

laid aside for roots of *Polygonum* to be dug up and eaten. The activity of geese feeding on this plant may generally be observed all over the feeding area.

It is evident that the geese also feed on other vegetation such as blades of grass and leafy plants, especially during the time they spend on land with their broods.

The food of the young geese is mostly paludal vegetation, which they browse. During some of the drives we organized to trap flightless birds, I noticed that the young birds, while walking, fed constantly on blades of grass.

The food supply is certainly not a problem on Bylot, plants such as *Polygonum* being abundant. It seems that such plants are common all over the areas where Greater Snows breed.

TRAPPING AND BANDING

As previously stated we banded 779 geese on Bylot. The first captured were 12 flightless nonbreeders located on a small pond on July 14. Three broods with nonmolting adults accompanying them also occupied the pond. The trap we used throughout the summer was made of poultry wire of one-inch mesh, four feet high. The trap was 10 feet or less in diameter. It opened into a long funnel built of nylon fish netting of two-inch mesh, five feet high. The trap was located at a convenient place on the shore where the pond was narrow and shallow. The wings of the funnel were extended along both shores. We then stretched a strong rope over the pond, and, starting from the side opposite the trap, drove the geese toward the funnel. We soon found out that a water-tight tin can containing a few pebbles was of great help: it served to float the rope and rattled merrily when the rope was jerked. It could also be moved sideways when the rope was pulled by either operator. In that fashion we moved toward the trap, pushing the geese ahead of the rope. We often had difficulty with the rear bird, which would try to jump the rope and swim back to the other end of the pond. If it succeeded in getting over or under the rope the others would invariably follow, and we had to start all over again. When the birds were close to the trap we generally had to enter the water to force them into it. In one instance where 131 subadults were trapped on a rather large lake, we had to work the birds for three hours to capture them.

The reaction of the geese as we approached them from a distance was not always the same. If we could surprise them they would swim to the middle of the pond when they saw us. If, however, they could see us coming from a distance they would often scramble up the shore and take off, running overland at a speed we could not match. This often rendered our work difficult as the flatness of the plateau made it hard to sneak up on the birds.

On July 29, we banded the first broods after trapping them in the manner described above. The young were then big enough to wear bands. In our banding we covered the area to a distance of about 12 miles from camp to the west, six miles to the east, and six miles inland. We continued banding until August 7 when the small motorboat we were to use until the end of the expedition arrived at the camp. We then made a trip to Cape Hay during which we noted that the geese were concentrating on the coast.

On August 16, we went by boat to the southwestern tip of the island on a banding expedition. The first flocks we met, congregations of broods, were on the shore. When they saw the boat the birds would start running ahead of it on the shore. Our technique then was to catch up with them and let two men jump ashore with the trapping equipment and run after the geese to prevent them from fleeing inland. Eventually the flock would take to the water where the motorboat would round them up and bring them back to the site where the trap was being put up. The trap was built on the shore, one side of the funnel entering the water and the other extending along the shore about 15 feet from the water. The two men ashore hid themselves while the motorboat operator herded the geese ashore. He then jumped out after the geese while the other men showed themselves and all together worked the birds into the trap. Half of the flock often managed to escape by swimming away, but catches were nevertheless good.

When we arrived at the point on the corner of the island, we spotted large flocks of geese on a coastal marsh. We set up a trap on shore and went after the closest group, about a quarter of a mile away. We surrounded that flock and drove it slowly to the trap. There were close to 300 birds in the flock, but many escaped by running away. We finally caught 43. However, we had learned a technique during that drive and believed we could do better if we tried again.

The main flocks were quite a distance away from us, but we decided to try and round up a few. One man followed the shore, one headed inland to surprise the geese from behind, while the third after a short wait walked straight for the geese. The pincer movement was successful and we finally had about 2,000 geese herded together. We then undertook to walk them to the trap, a mile and a half away.

One man walked in front of the flock and the two others brought up the rear. The Eskimos think that the geese follow the leader but I rather believe that they are pushed forward by the men behind and the leader merely prevents them from running away. It is interesting to note that the flock assumed a triangular shape to match the arrangement of the three men, one side of the triangle facing each man. The flock was thus moving on a broad front which tapered off to the sides and rear. As long as we kept the flock moving we had no trouble in keeping the birds in order; but if we stopped they faced in all directions and tried to escape. During the march the birds we had to watch were those at the tips of the triangle; a few rapid steps would bring them back into the flock. Some birds had completed their molt and they took to flight; but after a few circles around the flock they would generally alight back among the group, showing a strong gregarious instinct.

We finally let half the flock go; this was easily done by the lead man's abruptly stopping to let part of the flock walk past him. We then re-formed the remainder for driving. After a one-hour walk, including detours around bodies of water, we reached the trap site. We ran in enough geese to fill the trap, backed the remainder away, and two men held them while the other built a second trap from one wing of the funnel. We filled that trap too and then let the rest go. They settled down a hundred feet from the trap

and some went to sleep, but eventually they walked slowly away. We banded the 340 geese we had captured. The banding expedition had lasted 38 hours and 514 geese had been banded.

Those were the last geese we trapped. After that date most of the geese could fly and could not be captured. However, some broods not so far advanced were seen.

CULMEN LENGTH

I measured the culmen of 79 of the adult geese banded; the average length was 64.1 mm, the minimum 57.0 mm, the maximum 71.0 mm, and the standard deviation 3.3 mm. I had previously measured the culmen of 79 geese shot by hunters during the autumn of 1956 at Cap Tourmente. The average length in that case was 62.0 mm, the minimum 54.7 mm, the maximum 70.7 mm, and the standard deviation 3.0 mm.

The difference between the means, 2.1 mm, is significant ($t = 4.0$). However, since 47 of the bands I placed on the geese at Bylot have up to now been recovered in the Cap Tourmente area and only one elsewhere in Canada it is safe to assume that the Bylot geese are from the Cap Tourmente flock. Possibly enough Lesser Snow Geese join the flock at Cap Tourmente to cause the difference in culmen length; the hypothesis is supported by the recovery at Cap Tourmente in October, 1957, of a Snow Goose banded in August 1957 on Southampton Island. Moreover, only three Blue Geese (*Chen caerulescens*) were seen at Bylot out of approximately 20,000 snow geese, while at Cap Tourmente, the ratio of Blues to Snows is roughly one out of 1,000. Since the presence of Blues generally indicates the presence of Lesser Snows, one may conclude that there are more Lesser Snow Geese mixed with the flock at Cap Tourmente than on Bylot. However, only immatures of the year were measured at Cap Tourmente, whereas only adults were measured at Bylot; it could be that the culmen of young birds is not yet fully grown when they arrive at Cap Tourmente in autumn. That is probably the more plausible explanation for the observed difference in culmen size.

PREDATORS

The Snow Geese are not bothered to any great extent by predators on their Bylot breeding grounds. Foxes, weasels, dogs, ravens, owls and jaegers may occasionally prey on the adults, eggs, or young.

Foxes were not abundant enough in 1957 to cause much trouble; no evidence of fox depredation was noted. Eskimos and whites agreed that the effect of foxes is very limited. Weasels may destroy some eggs, but one goose should be able to deal with a weasel easily unless, of course, it came at a time when both geese were away from the nest. Dogs can undoubtedly cause much destruction in a goose colony; Eskimo dogs roam the country constantly whenever they are let loose, and often cover great distances. I have seen dog tracks in a goose colony while there was still snow on the ground, and evidence of dog depredation on eggs. Fortunately, Eskimos do not often camp on the part of Bylot Island where the geese breed. Jaegers are specially abundant in the area but ravens are scarce. The geese showed signs of wariness when they sighted either of those birds, but it does not appear that they are important

predators. Snowy Owls apparently do not prey on goslings very much. Only once did I find a dead gosling on the rim of an owl's nest, though there were always a few dead lemmings there. The geese would not nest so close to owls if they were usually bothered much by them. They may even do so because owls rid the habitat of weasels.

The natives do not take many geese or eggs. They are busy hunting seals and other marine mammals throughout the nesting season. Food is plentiful then, so they do not bother going after geese or goose eggs. Children from a camp may go eggging if there is a goose colony close by. According to R.C.M. Police and the Hudson's Bay Company people, the Eskimos do not utilize geese to any great extent in the Pond Inlet district. On the other hand, my guide was quite familiar with techniques for catching geese, and the birds we forced into the water and rounded up with the boat could easily have been clubbed or shot. It is a fair presumption that traveling Eskimos occasionally procure a few geese in that manner. Since the meat cannot be preserved at that time of the year I doubt whether they take more than they can use in a short period. I do not think Eskimos would make special trips after geese unless food became scarce.

CONCLUSIONS

The number of observations is often too small to allow drawing definite conclusions, but I believe we now have a good enough idea of the whole picture for management purposes. I do not think that any factors in the breeding area of the geese might be considered as limiting the size of the population. The breeding grounds are so vast that additional nesting areas would certainly be available if the population increased significantly, especially when considering that geese do not require exclusive nesting sites. The food supply is not a problem either; the plants which the geese feed on are widely distributed and common throughout the Eastern Arctic.

There have been, however, some poor reproductive seasons for Greater Snow Geese and it is safe to assume that there will occasionally be others. It must be borne in mind that the breeding period of the geese extends throughout the whole favorable season in the high Arctic; they start to nest when spring has hardly begun and leave with their young in September when winter is well on its way. Nights were already long when I left Bylot at the end of August and they were lengthening rapidly, and ice was beginning to form at the edge of small ponds. It is quite apparent that a late spring, and possibly an early autumn, could have a very adverse effect on the reproduction of the geese. A heavy snowfall in the spring, at the time geese normally start nest-building, might cover the ground long enough to delay them so long that the young would not be able to leave on time in the autumn. There is normally just enough time for the geese to breed successfully during the summer, and any shortening of that time would be important.

SUMMARY

The author spent the period May 27 to August 29, 1957, on Bylot Island, N.W.T., studying the breeding biology of the Greater Snow Goose. The

geese nest mainly at the southwest corner of Bylot, where the land is relatively flat and marshy and is protected from the north by the high mountains.

The first geese arrived on June 2. A total of approximately 15,000 nest in colonies on the slopes of ravines or on sheltered plateaus. Two colonies were closely studied and information gathered on egg-laying, clutch size, incubation and hatching. The food, feeding habits, behavior, and molt of the geese were also studied. The young began to fly about August 20, approximately six weeks after hatching.

Seven hundred and seventy-nine geese were banded, mostly young birds. Forty-seven bands have since been recovered at Cap Tourmente, Quebec.

Food is plentiful for the geese on their breeding grounds, and it appears that there are no factors limiting the increase of the Greater Snow Goose population in those areas.

NOTES

A Case of Hellebore Poisoning

IN CASES where people are poisoned by eating native plants it is usually not clear what plant species are involved. In addition, other details of the incident may be vague. The following account of three boys, all probably in their late teens, was reported by them to the Nature House in Manning Park, British Columbia. All had eaten Indian hellebore (*Veratrum eschscholtzii* A. Gray), and all were able to give carefully thought-out details on the amounts eaten and on the symptoms resulting.

Frank Martin (Chelan, Washington) with Karl and Raymond Ostling (Seattle, Washington) camped at Sunrise Lake, Washington, for the night of July 4, 1958, while on a hike from Chelan to Manning Provincial Park, between Hope and Princeton, in British Columbia. They were near timberline.

To augment their rations they gathered a quantity of stems of a plant they thought was skunk cabbage (*Lysichitum americanum* Hult. & St. John). This subsequently proved to have been *Veratrum*. The portion eaten was largely blanched stem from near ground level, though some fibrous green tissue from higher on the stem was also used. They did not use the roots. The dirty outer layer of stem was discarded, and the remainder boiled

in water for about half an hour until it was soft. The cooked vegetable was served with their evening meal at 8 p.m.

Frank Martin disliked the stinging bitter taste, and ate only about half a gram. He felt no immediate symptoms but awoke at about 1 a.m. the following morning feeling nauseated. Beyond this mild discomfort there were no other symptoms.

Karl Ostling reported that he ate about a cupful of the white blanched stem and a lesser amount of the fibrous green tissue. Most of his green portion he left for Raymond, as he found this less palatable. He described the taste as "bitter, but not really bad."

Karl had no immediate symptoms, but awoke about 1.30 a.m. the following morning after having had "very severe bad dreams." He was extremely nauseated, and retched heavily for 2 to 3 hours. His stomach hurt until morning, and he found himself unable to focus his vision for some time in the morning light. He felt dizzy in the morning, though this and the other symptoms disappeared early in the day.

Raymond Ostling ate about a cup of blanched stem tissue together with his own and most of Karl's share of the green tissue. He ate nearly two cupfuls altogether.

Raymond felt nauseated within 15 minutes of eating and vomited. He ate some stew as soon as his stomach settled, then went to bed with the others. He awoke about 1:30 a.m. without any recollection of having had bad dreams. He again felt nauseated and vomited twice. He, too, had difficulty with his vision the following morning, being unable to see detail in bright light. This symptom lasted but a few minutes.

The boys stayed in camp all day on July 5 to regain their strength, and were then able to proceed without further trouble. They arrived at Manning Park on July 27. On this date they could report that they felt no ill effects from their experience.

J. EDWARD UNDERHILL

Department of Recreation and
Conservation

Victoria, British Columbia
14 October 1958

The Pug Moth *Eupithecia stellata* Hlst. at The Pas, Manitoba

THE FIRST record of *E. stellata* for The Pas area was made in 1950 and, in spite of special searching, the species has been collected infrequently since then. In view of its scarcity I am reporting here the complete list of collections for this district.

In 1950 two male specimens were taken at lighted shop windows in town, one on August 25, the other on September 21. In 1951 one specimen was taken on July 16 in town and another on August 9 in Devon Park. In the same year a specimen was collected on August 12 at Wabowden by Mr. Jack Bohay. It may be a northern record for this species in Manitoba. In 1952 one specimen was taken at light on May 23, two on June 6 and one on June 20. Four specimens were collected in 1953, one on June 25, one on July 7, one on August 8 and one on August 9. No further specimens were taken during periods of collection in The Pas, Devon Park, Gillam, and Lynn Lake in succeeding years. During 1958,

Mr. Sam Waller collected 11 specimens in mixed woodland near the Little Museum at The Pas. The specimens in his collection were: one on August 4, one on August 12, four on August 13, three on August 18, one on September 1 and one on September 4. They are now in the collections of the Halifax Museum of Science.

A study of the dates of the collections suggests a highly irregular flight period, possibly extending from spring (May 23, 1952) to fall (September 21, 1950). This may account for the scarcity of the species in collections. Perhaps more will be collected when the habitat becomes known.

I wish to acknowledge with thanks the identification of the first collected specimen by Dr. E. G. Munroe, Insect Systematics and Biological Control Unit, Canada Department of Agriculture, Ottawa. A small series of specimens will be deposited in the Canadian National Collection at Ottawa and another in the collections of the American Museum of Natural History, New York.

WALTER KRIVDA

P.O. Box 864
The Pas, Manitoba
10 November 1958

Bobolink Nesting at Penticton, British Columbia

A NEST of the Bobolink *Dolichonyx oryzivorus*, containing four eggs, was collected by the writer in a hay meadow near Okanagan River, Penticton, B.C., on June 8, 1958. Both male and female were observed and identified. Previously, on June 29, 1957, a nest with five chicks and one infertile egg (the last collected) was found in the same field. These are the only Bobolink finds that have come to my attention during my 51 years residence here.

REGINALD N. ATKINSON

Penticton Museum
Penticton, British Columbia
16 December 1958

A Poisonous Fungus in the Northwest Territories

DURING a visit to a field camp of the Canadian Wildlife Service, August 17 to 20, 1957, I found the men using fungi extensively in their cooking. The field camp was located on Mosquito Lake at latitude $62^{\circ} 48'$, longitude $103^{\circ} 28'$. We discussed the probability of finding species of poisonous fungi at that location and it was pointed out that there were as yet no authentic records of poisonous fungi in the Northwest Territories. On the morning of August 19, Saskatchewan Game Branch Ecologist E. Kuyt, a member of the party, brought in a specimen of what appeared to be *Amanita muscaria* (L.) Fr. The identification was checked in Yellowknife by the author and was confirmed by a letter of August 22 from Dr. H. J. Scoggan of the National Museum who had submitted our specimen to Dr. Walton Groves of the Botany and Plant Pathology Division, Science Service, Ottawa.

It is believed that this is the first report of a poisonous fungus in the Northwest Territories and it is interesting to note that the location where it was found is well beyond tree line in the eastern barrens of the Mackenzie District.

JOHN P. KELSALL

Canadian Wildlife Service

Box 117

Yellowknife, Northwest Territories

30 August 1957

Nematode Worms, *Diplotrriaena tricusps* (Fedt.), from the Body Cavity of a Nashville Warbler at London, Ontario

ON 21 MAY 1955 the writer received from R. E. Lemon a female Nashville Warbler *Vermivora ruficapilla* which had been found lying dead on Huron Street in London, Ontario. When the bird was dissected a mass of coiled worms was found in the body cavity on each side of the heart. To the right of the

heart there were seven worms and to the left fourteen worms. They were identified by Miss G. A. Webster, Institute of Parasitology, McGill University, as *Diplotrriaena tricusps* (Fedt.) (Filariidae). Some of the specimens are deposited in the collection of the Institute of Parasitology and the remainder in the collection of the Department of Zoology, University of Western Ontario.

Nematodes of the genus *Diplotrriaena* are parasites in the body cavities of birds (Yorke and Maplestone, 1926) and several species are found in North American birds (Canavan, 1931; Seibert, 1944). As many as 46 worms have been found in one bird (Ogren, 1950). *D. tricusps* has been reported from several birds, particularly of the family Corvidae (Canavan, 1931; Morgan and Waller, 1940).

REFERENCES

- CANAVAN, W. P. N. 1931. Nematode parasites of vertebrates in the Philadelphia Zoological Garden and vicinity. *Parasitology* 23:196-229.
- MORGAN, B. B., and E. F. WALLER. 1940. The occurrence of a rare filariid nematode from a crow. *Amer. Midl. Nat.* 24:379-381.
- OGREN, R. E. 1950. Occurrence of *Diplotrriaena thomasi* Seibert in the slate-colored junco. *J. Parasit.* 36:85.
- SEIBERT, H. C. 1944. Notes on the genus *Diplotrriaena* with the description of a new species. *Trans. Amer. micr. Soc.* 63:244-253.
- YORKE, W., and P. A. MAPLESTONE. 1926. The nematode parasites of vertebrates. London, J. and A. Churchill.

WILLIAM W. JUDD

Department of Zoology
University of Western Ontario
London, Ontario
14 January 1958

An Occurrence of Lodgepole Pine in the Mackenzie District

RAUP (Sargentia 6:106. 1947) notes that "the occurrence and distribution of the lodgepole pine in southwestern Mackenzie is still to be discovered."

On August 10, 1953, on the South Nahanni River I collected twigs and cones of pine which I identified as lodgepole pine *Pinus contorta* Dougl. I sent specimens to George Wilson who was then resident forester with the Department of Resources and Development at Fort Smith, Northwest Territories. He confirmed my identification.

The location of the specimens collected was 61° 12' N, 124° 25' W, on the plateau just south of the South Nahanni River at an elevation of about 2800 feet. There were several lodgepole pine on the site.

DONALD R. FLOOK

Canadian Wildlife Service
Federal Building
Edmonton, Alberta
29 September 1958

A Joint Clutch of Barrow's Goldeneye and Bufflehead Eggs

ON JUNE 11, 1958, a duck nest was discovered near a slough northeast of Riske Creek, in the Chilcotin district of British Columbia, by a field party led by L. G. Sugden of the B.C. Game Department and including A. J. Wiggs, W. D. McLaren, and the writer. The nest was located in a senile aspen, 53 inches below the entrance to the cavity. At this time a female Barrow's Goldeneye *Bucephala islandica* was incubating a clutch of seventeen eggs. Fifteen of these were Goldeneye eggs, of which about half were pipping; one of the two Bufflehead eggs was also pipping. In addition, the nest contained the desiccated corpses of two adult female Bufflehead *Bucephala albeola*, which were estimated to have been dead for one and two years respectively. The more recent of these two birds contained an egg in the aperture of the cloaca, so that death presumably took place while the bird was in the act of laying. No evidence of the cause of death was observed.

The nest was visited on June 13 by Sugden and Dr. J. Hatter of the B.C.

Game Department. At that time a female Goldeneye was seen upon the slough, accompanied by twelve young Goldeneye and one young Bufflehead. Three tired young Goldeneye were found in the nest cavity and were liberated, while the remaining unhatched Bufflehead egg was found to be undeveloped. The great depth of the nest would probably have prevented the escape of the weakest of the young Goldeneye under other circumstances.

No evidence was obtained to indicate whether the Bufflehead eggs were laid before the Goldeneye began laying, during the laying period of the latter, or after incubation had begun. The incubation period of Bufflehead averages less than that of Goldeneye (29 days compared to 32 days), so it seems probable that the Bufflehead eggs were laid later on. The only previous record of a mixed clutch embracing Bufflehead eggs is of one nest containing eight eggs of Goldeneye (species not known, probably Common) and one Bufflehead egg, found by A. D. Henderson on May 26, 1925, probably near Belvedere, Alberta (Oologist 44:166-168, 1927).

ANTHONY J. ERSKINE

Department of Zoology
University of British Columbia
Vancouver 8, British Columbia
8 October 1958

Bony Shells of Musk Turtles in Nest of Bald Eagle

IN JUNE 1955, members of the Kingston Natural History Club and student biologists from Queen's Biological Station at Lake Opinicon watched Mr. C. L. Broley climb to an eagle's nest in a large tree near Seeley's Bay, Ontario. The nest was occupied by a pair of adult Bald Eagles *Haliaeetus leucocephalus* and two young in juvenal plumage.

Mr. Broley threw down to us some of the animal remains that were in the nest. We were most surprised to count among the remains the empty shells of 12 musk turtles *Sternotherus odoratus*. Imler and

Kalmbach (Circ. U.S. Fish Wildl. Serv. 30, 1955) found that turtles occur infrequently in the diet of Bald Eagles and musk turtles have not been recorded as an item of food. We captured one musk turtle in a trap set in Lake Opinicon. Other than this, in three summers of field work on and about the lake, musk turtles were not observed. This might

be expected from the highly aquatic nature and nocturnal tendencies of the animal (Carr, A. F. Handbook of turtles. Ithaca, Comstock, 1952).

JAMES F. BENDELL

Department of Zoology
University of British Columbia
Vancouver 8, British Columbia
10 November 1958

REVIEWS

Ectoparasites of the Cottontail Rabbit in Lee County, Northern Illinois

By LEWIS J. STANNARD, Jr., and LYSLE R. PIETSCH. Urbana, Illinois Natural History Survey, 1958. 18 p. Free (Biological Notes No. 38)

Presented in attractive booklet form, this article deals mainly with seven species of facultative or obligate ectoparasites taken from cottontail rabbits in northern Illinois during the period May 1952 to November 1954. In all, however, the economic importance and vectorial implications of fifteen species including ticks (3 spp.), fleas (6 spp.), bot flies (3 spp.) and chiggers (3 spp.) are discussed.

The authors have amassed a great deal of data in a relatively short period of time and are to be congratulated for the clear, straightforward presentation of their findings. The article is enhanced by many useful tables, charts, maps and photographic illustrations. Such a factual and well-documented treatise on the ecology of the principal species involved is of fundamental interest to all who come in contact with the ubiquitous cottontail—scientists, conservationists and sportsmen alike. J. FRANK McALPINE

The Birds of Alberta

By W. RAY SALT and A. L. WILK. Edmonton, Department of Economic Affairs, Government of Alberta, 1958. For sale by the Queen's Printer, Highways Building, Edmonton, Alberta. 511 p. \$5.00.

This book is intended primarily to aid those "who are not too well acquainted with . . . birds . . . and who would like to know them better." There is an illustration and description of each species,

as well as notes on nesting habits, range, and characters useful in identification. Breeding plumages are emphasized. The range of each species in Alberta is depicted by a map. A road map and a map of vegetation zones appear on the end papers.

The illustrations are somewhat of a mixed bag; they include color photographs, reproductions of paintings, and pen-and-ink sketches. Some are excellent.

The general remarks on each species are written in a pleasant style and recount useful and interesting information.

DAVID A. MUNRO

Changes in the Fauna of Ontario

Edited by F. A. URQUHART. A Contribution of the Division of Zoology and Palaeontology, Royal Ontario Museum. Toronto, University of Toronto Press, 1957. 75 p. \$1.50.

This is a valuable compilation of known changes that have taken place in animal populations of Ontario mostly in recent times. Emphasis is on alteration of range patterns.

Insects (p. 4-12), mainly Orthoptera, are dealt with by E. M. Walker; amphibians and reptiles (p. 13-18) by E. B. S. Logier; fishes (p. 18-25) by W. B. Scott; birds (p. 26-42) by L. L. Snyder; and mammals (p. 43-58) by Randolph L. Peterson. There is a brief introduction by F. A. Urquhart and a 20-page chapter by M. K. Thomas on changes in the Ontario climate.

The data are well documented and interestingly presented with many concise interpretive comments.

W. EARL GODFREY

The Ghost of North America: the Story of the Eastern Panther

By BRUCE S. WRIGHT. New York, Vantage Press, 1959. 140 p. \$3.50.

Thanks to the untiring efforts of Bruce S. Wright, Director of the Northeastern Wildlife Station at Fredericton, New Brunswick, biologists and woodsmen can now state, without fear of contradiction, that the eastern panther or cougar is still extant in the northeast and, indeed, is slowly increasing in numbers. To those who are not familiar with the controversy that has raged on the subject over a period of years, this may not seem a remarkable statement. But opinions have been sharply divided: one group maintained that the panther could not possibly survive in the rather thickly settled northeast for three or four decades without being detected, while the opposing group as stoutly contended that there are plenty of wilderness areas where the big cat could live undisturbed and, furthermore, that there have been too many reports from reliable sources to relegate the panther to the list of extinct animals.

Approaching the problem from a strictly scientific point of view, Mr. Wright collected all pertinent data and then proceeded to separate fact from fiction. He interviewed all those who claimed to have seen panthers and whenever possible he examined the areas where the animals were purported to have been seen. He publicized his study widely and asked that people in his area inform him when panthers or their tracks were observed. As time went on, reports began coming in and he personally was able to examine many tracks and other signs of panthers.

In this highly readable book, Mr. Wright traces the history of the panther from the Pleistocene to the present. He explains how relentless hunting by the white man reduced it almost to extinction. It was saved from this fate, he contends, by the great upsurge in the deer population after the clearing of the country. Besides these interesting data,

he gives a thorough review of the habits and characteristics of the cougar which makes extremely absorbing reading even for those who have only a slight interest in the species. The twenty-three photographs add immeasurably to the interest and value of the book.

Of particular interest to biologists and sportsmen is the section devoted to panther signs. The author answers such questions as: How can the track of a panther be distinguished from that of a large dog, wolf, bear, bobcat or lynx? How can a kill made by a panther be distinguished from that of a bear or lynx? What are the distinguishing characteristics of a scrape and how can it be used in determining the direction in which the animal was traveling at the time?

To all outdoorsmen, whether sportsmen or naturalists, *The Ghost of North America* can be highly recommended. It should make the ideal fireside companion.

AUSTIN W. CAMERON
Curator of Mammals
National Museum of Canada

Tales from the Vienna Woods

By LILLI KOENIG. Translated by MARJORIE LATZKE. London, Methuen, 1958. 159 p. \$3.75.

This book, a translation from the original German text published in Vienna in 1951 under the title *Die Klaren Augen*, should be a source of inspiration to naturalists everywhere. It is an account, in popular style, of some valuable scientific studies of animal life and behavior that were carried out at a unique biological research station near Vienna. This station, "Wilhelminenberg," is set in a densely wooded slope where the Danube bends southward around the Wienerwald. The foreword, written by Konrad Lorenz, world authority on animal behavior, provides a very interesting account of the founding of the station by the author and her husband, Otto Koenig, and an appreciation of the many scientific publications that have come from it.

Life on the station and the studies carried out there are described vividly by the author and one is constantly impressed by her complete sense of enjoyment and her infinite patience in the work. Apparently none of the excitement and color have been lost in the translation from the author's original accounts of her experiences in rearing and studying the behavior of turkeys, golden pheasants, graylag goslings, guinea fowl, kestrels, bee eaters, dormice, badgers, hares, nutria, gray squirrels, roe deer, and fennec or long-eared desert fox. The book is well illustrated with 24 halftone plates and many enchanting line drawings of the birds and animals studied. It is an exciting adventure and highly recommended as enjoyable reading for all students of natural history.

RUTH HORNER ARNOLD

A Century of Biological Research

By HARLOW B. MILLS and others. Urbana, Illinois Natural History Survey, 1958. Free. (Bull. Ill. nat. Hist. Surv., vol. 27, article 2, p. 85-236, 1958)

Among state biological agencies one of the most respected is the Illinois Natural History Survey. That organization began life as a natural history society on June 30, 1858, and to celebrate its centennial last year the survey has published 151 pages of historical information on the work done during the intervening 100 years. The program is discussed under the headings: economic entomology, faunistic surveys, applied botany, aquatic biology, wildlife research, publications and public relations, library, former technical employees and literature cited.

The reader interested in the evolution of a well-run state agency, faunistic surveys dating back to 1840, or adventures and developments in biological research, will find this bulletin of absorbing interest. It is well produced, attractively illustrated and a credit to the great agency on which it reports.

V. E. F. SOLMAN

Conservation Papers

The Royal Bank of Canada has prepared for distribution a number of bulletins on the general subject of conservation. In one collection are ten reprinted newsletters that bear the following titles: "On Using Soil Wisely," "Conservation of Soil," "Use Without Using Up," "Two Better Blades of Grass," "The World's Food," "Good Food Conserves Health," "Forests are Worth Preserving," "Our Mineral Resources," "Life Depends on Water" and "Our Climate and Our Weather." They are well written and informative but not exhaustive.

"Conservation of Wildlife," in the same binder as the papers just mentioned, brings together much of the philosophy on which conservation is ideally based and discusses the whys as well as the hows. In his preface President James Muir sets the stage with a few well chosen words.

"There is no country on earth more blessed than Canada with variety and quantity of resources but they are not inexhaustible. We who live and work in Canada are the custodians of this wealth: we hold it in trusteeship for wise use now and to hand down without waste to those who follow us."

"Woodlots," first published several years ago and revised in 1956, deals with the esthetics and economics of woodlot management.

"Bird Houses," a 6-page folder attractively prepared, summarizes construction methods and dimensions for houses for 9 common birds that will use houses.

The publications mentioned above are available free from the Royal Bank of Canada, Montreal, Quebec, as part of a commendable public service of that bank. They will be of interest and service to all who love nature and take thought for the future of our natural resources.

V. E. F. SOLMAN

AFFILIATED SOCIETIES

British Columbia Bird and Mammal Society

President, M. D. F. UDVARDY, Dept. of Zoology, University of British Columbia, Vancouver 8, B.C.

Edmonton Bird Club

President, PROF. W. R. SALT; *Vice-President*, DR. K. BALL, *Secretary-Treasurer*, W. G. LAWRENCE TWIGGE, 11343 67th St., Edmonton, Alta.; *Field Secretary*, H. C. PEGG; *Audubon Representative*, R. HEATH; *Editor*, E. O. HÖHN; *Librarian*, G. BALL.

McIlwraith Ornithological Club

Past President, DR. W. W. JUDD; *President*, H. A. U. MONRO; *Vice-President*, DR. F. S. COOK; *Recording Secretary*, D. DOW; *Treasurer*, MISS M. MACPHERSON; *Corresponding Secretary*, MRS. M. E. LEAHY, 682 HURON St., London, Ont.; *Migration Secretary*, J. W. LEACH, 376 Platt's Lane, S.S. 3, London, Ont.

Natural History Society of Manitoba

President, DR. J. C. RITCHIE; *Treasurer*, HAROLD MASSOP; *General Secretary*, E. DOWTON, 47 Cunningham Ave., Winnipeg 8, Manitoba.

Nova Scotia Bird Society

President, DR. HARRISON F. LEWIS; *Vice-President*, C. R. K. ALLEN; *Secretary-Treasurer*, MRS. S. WARD HEMMEON, c/o Nova Scotia Museum of Science, Spring Garden Road, Halifax, N.S.; *Editor*, DR. LLOYD B. MACPHERSON.

Provancher Society of Natural History of Canada

President, J. KENNEDY HILL; *First Vice-President*, FRANCOIS HAMEL; *Second Vice-President*, RONALD E. BLAIR; *Secretary-Treasurer*, GEORGES A. LECLERC, 628 Fraser St., Quebec, Que.

Province of Quebec Society for the Protection of Birds

President, C. C. SALT; *Vice-Presidents*, J. DELAFIELD, MISS R. B. BLANCHARD; *Treasurer*, MISS G. E. HIBBARD; *Secretary*, MISS RUTH S. ABBOTT, 164 Sennéville Road, R.R. 1, Ste. Anne de Bellevue, Que.; *Librarian*, MRS. P. H. DU BOULAY.

Toronto Field Naturalists' Club

President, DR. WALTER TOVELL; *Vice-President*, FRED BODSWORTH; *Secretary-Treasurer*, MRS. HILTON ROBSON, 49 Craighurst Avenue, Toronto 12, Ont.

Vancouver Natural History Society

Honorary President, N. A. M. MACKENZIE; *Past President*, A. R. WOOTTON; *President*, J. J. PLUMMER; *Vice-President*, FRANK SANFORD; *Honorary Secretary*, J. Y. NEILD; *Recording Secretary*, MISS ETHEL FUGLER; *Program Secretary*, JOHN GARDNER; *Honorary Treasurer*, FRANK SANFORD; *Librarian*, MRS. S. F. BRADLEY; *Editor of Bulletin*, C. B. W. ROGERS.

ADVICE TO CONTRIBUTORS

Manuscripts

Manuscripts should be typewritten on one side of nontransparent paper measuring $8\frac{1}{2}$ by 11 inches. Authors are requested to use at least one given name. All text matter, including quotations, footnotes, tables, literature references, and legends for figures should be double-spaced. Only those words meant to appear in italics should be underlined. Every sheet of the manuscript should be numbered.

Webster's New International Dictionary is the authority for spelling.

References are made by the author-date system. They should be listed alphabetically and typed at the end of the main body of text. For titles in reference matter, abbreviations follow the rules in the *International Code for the Abbreviation of Titles of Periodicals* and the *World List of Scientific Periodicals*.

Other abbreviations should be used sparingly. The better-known terms of measurement follow CSA Specification Z85-1943 *Abbreviations for Scientific and Engineering Terms* or the equivalent of the American Standards Association (Z10.1-1941).

Tables should be titled and numbered consecutively in arabic numerals. Tables and legends for the figures should be placed after the list of references. Each table and all the legends should be on separate pages.

Notes should bear the name of one author only

and references in notes should be incorporated directly in the text.

Illustrations

All figures, including each figure of the plates, should be numbered consecutively in arabic numerals. The author's name, title of the paper, and figure number should be written in the lower left corner of the sheet on which the illustration appears. The legend should not be incorporated in the figure.

Line drawings should be made with India ink on white drawing paper, blue tracing linen, or blue-lined co-ordinate paper. Co-ordinate lines that are to appear in the reproduction should be ruled in black ink. Descriptive matter should be lettered, not typewritten, and all parts of the drawing should permit easy legibility even if a reduction is made.

Photographs should have a glossy finish and show sharp contrasts. For reproduction as a complete plate they should be mounted without space between prints.

For large drawings and mounted photographs the ratio of height to width should conform to that of the journal page ($4\frac{1}{4}$ by $7\frac{1}{4}$ inches) but the height should be adjusted to allow for the legend.

Reprints

Reprints, with or without covers, may be bought. The cost is given on the reprint order form which is attached to the galley proofs.

CANADA NORTH OF FIFTY-SIX DEGREES

THE LAND OF LONG SUMMER DAYS

by

E. M. KINDLE

An authoritative account of Canada's Northland
published in *The Canadian Field-Naturalist*
Vol. 42, 1928

Price: \$1.00

Available from:

W. J. CODY, *Business Manager*
The Canadian Field-Naturalist
Science Service Building
Ottawa, Ontario

The CANADIAN FIELD-NATURALIST

MOSS. COMP. ZOO
LIBRARY
AUG 17 1959
HARVARD
UNIVERSITY

Published by THE OTTAWA FIELD-NATURALISTS' CLUB, Ottawa, Ontario

Compliments to . . .

Ninth International Botanical Congress
MONTREAL, QUEBEC, AUGUST 19-29, 1955

Articles

- Notes on the Phytoplankton of Karluk Lake, Kodiak Island, Alaska
DOUGLAS K. HILLIARD 135
- The Dog-strangling Vine *Cynanchum medium*, its Chromosome Number and its
Occurrence in Canada
RAYMOND J. MOORE 144
- Some Inflorescence Forms in Clovers and other Legumes
WILLIAM G. DORE 147
- Contributions to the Flora of Nova Scotia. VI. Notes on the Vegetation of the
Bird Islands
E. CHALMERS SMITH and WILFRED B. SCHOFIELD 155
- Grassland Vegetation near Fort Providence, Northwest Territories
JOHN W. THIERET 161
- Additional Plant Records from Spence Bay, Boothia Isthmus
D. B. O. SAVILE 168
- Adventive Plants at Churchill, Manitoba
EVA BECKETT 169

Notes

- A Summer Record of the Great Gray Owl in Southern British Columbia
JAMES GRANT 173
- Hummingbirds Attacked by Wasps
JAMES GRANT 174
- Wing-clapping Display of the Long-eared Owl
JAMES GRANT 174
- Notes on the Great Auk in Nova Scotia
W. EARL GODFREY 175
- Golden Plover in Nova Scotia
ROBIE W. TUFTS 175
- Spring Emergence of the Western Chorus Frog
STANLEY W. GORHAM 176
- History of the Cottontail in Manitoba
STUART CRIDDLE 177
- Magpie Specimen from Wrigley, N.W.T.
JOSEPH E. BRYANT 177
- Nesting of the Golden Eagle at Sugluk Inlet, Ungava, Quebec
WALTER R. SPOFFORD 177

Reviews

- Biological Research in Conservation — The Mammals of North America — The Birds of Alaska —
The Freshwater Fishes of Canada — General Biology — Lead Poisoning as a Mortality
Factor in Waterfowl Populations

THE OTTAWA FIELD-NATURALISTS' CLUB

FOUNDED IN 1879

The objects of the club are to foster an acquaintance with and a love of nature, to encourage investigation and to publish the results of original research and observations in all branches of natural history. The patron is His Excellency, the Right Honorable Vincent Massey, C.H., Governor General of Canada. The club is a corporate member of the Federation of Ontario Naturalists.

MEMBERS OF COUNCIL

EDWARD L. BOUSFIELD, *President*, National Museum of Canada, Ottawa, Ontario

W. WINSTON MAIR, *First Vice-President*

DONALD R. BECKETT, *Second Vice-President*

JOHN M. GILLETT, *Treasurer*, Plant Research Institute, Research Branch, Canada Department of Agriculture, Ottawa, Ontario

A. W. FRANK BANFIELD, *Secretary*, National Museum of Canada, Ottawa, Ontario

I. L. CONNERS, C. FRANKTON, *Auditors*

MRS. JOHN W. ARNOLD, MISS ANNE BANNING, MISS CHARLOTTE DILL, MRS. JOHN HAWKSBRIDGE, MISS VIOLET HUMPHRIES, MISS PAULINE SNURE, THE REVEREND F. E. BANIM, MESSRS. J. W. ARNOLD, W. K. W. BALDWIN, D. R. BECKETT, B. BOIVIN, A. E. BOURGUIGNON, K. BOWLES, A. W. CAMERON, W. J. CODY, I. L. CONNERS, C. FRANKTON, R. FRITH, W. E. GODFREY, H. GROH, J. W. GROVES, R. A. HAMILTON, W. I. ILLMAN, H. LLOYD, C. R. PATTERSON, A. E. PORSILD, L. S. RUSSELL, D. B. O. SAVILE, H. J. SCOGGAN, G. W. SINCLAIR, V. E. F. SOLMAN, J. S. TENER.

THE CANADIAN FIELD-NATURALIST

K. W. Neatby Building, Canada Department of Agriculture
Ottawa, Ontario

ROBERT A. HAMILTON, *Editor*

W. J. CODY, *Business Manager*

Associate Editors: F. J. ALCOCK (Geology), JOHN W. ARNOLD (Entomology), W. A. BELL (Paleontology), J. SHERMAN BLEAKNEY (Herpetology), AUSTIN W. CAMERON (Mammalogy), WILLIAM G. DORE (Botany), J. R. DYMOND (Ichthyology), W. EARL GODFREY (Ornithology), A. G. HUNTSMAN (Marine Biology), A. LAROCQUE (Conchology).

The Canadian Field-Naturalist is published quarterly by the Ottawa Field-Naturalists' Club with the assistance of affiliated societies listed on the inside back cover. Manuscripts representing personal observations or the results of original research in any branch of natural history are invited. In the preparation of papers authors should consult the most recent issue and the information for contributors on the inside back cover. Advertising rates and prices of back numbers of this journal and its predecessors, *TRANSACTIONS OF THE OTTAWA FIELD-NATURALISTS' CLUB*, 1879-1886, and the *OTTAWA NATURALIST*, 1887-1919, are obtainable from the business manager.

MEMBERSHIP AND SUBSCRIPTION

The annual membership fee of \$4.00 covers subscription to the journal. Institutions, however, may subscribe at the same rate as that for membership. Single current numbers of regular issues are one dollar. Money orders should be made payable to the Ottawa Field-Naturalists' Club and sent to the treasurer. Notice of change of address should also be sent to the treasurer.

The Canadian Field-Naturalist

VOLUM 73

JULY-SEPTEMBER 1959

NUMBER 3

NOTES ON THE PHYTOPLANKTON OF KARLUK LAKE, KODIAK ISLAND, ALASKA

DOUGLAS K. HILLIARD

Arctic Health Research Center

Public Health Service

U.S. Department of Health, Education, and Welfare
Anchorage, Alaska

DURING the period June 20, 1956, to November 22, 1957, a biological investigation was conducted at Karluk Lake, Kodiak Island, Alaska, to determine the local occurrence of coracidia hatched from the ova of the fish tapeworm *Diphyllbothrium ursi* Rausch, 1954.

This investigation required an intensive sampling program in which plankton were gathered with a No. 20 silk net at approximately weekly intervals during the ice-free seasons and once a month following the formation of ice cover (December through April). Collecting was done at two stations: one near the mouth of the Thumb River, and at the No. 2 station established by Juday, Rich, Kemmerer, and Mann (1932); these are shown in Figure 1.



FIGURE 1.—Map of Karluk Lake showing Station No. 2 where plankton samples were gathered.

Mailing date of this number: 10 August 1959

Sampling methods were similar to those used by Juday (1932). All of the material reported on herein was collected from the No. 2 station. There were, in all, 46 collections made.

In addition to the regular gathering of invertebrate material, considerable quantities of phytoplankton were obtained. It is the purpose of this paper to give an account of the phytoplankton and, when applicable, to compare it with the collections made by Juday (1932).

PREVIOUS WORK

Although Karluk Lake drainage is one of the world's most important red salmon systems, very little has been published on its phytoplankton, and of this virtually nothing on species composition. Juday (1932) did a comprehensive study of the physical and chemical aspects of the lake, including quantitative estimates of the plankton during the summer months of 1926-1930. Their studies revealed 49 genera of algae from the plankton catches, but the species were not indicated. Mann (*in* Juday and others, 1932) cited 26 genera and 67 species of diatoms found in bottom deposits from the lake, though no references were made to planktonic forms. More recently Croasdale (1958) described as new several forms and varieties of desmids from material provided by the writer. The above-cited publications constitute the only contributions to knowledge of phytoplankton in Karluk Lake.

DESCRIPTION AND CLASSIFICATION OF THE LAKE

Certain limnological features of Karluk Lake, described in detail by Juday (1932), are briefly summarized as follows. The lake is situated in south-central Kodiak Island, at 57° 24' N 154° 5' W. Its long axis (12.2 miles) is oriented in a north-south direction and has a maximum width of two miles. The lake covers an area of 14.8 square miles, has a maximum depth of 413 feet and a mean depth of 159 feet. The elevation above sea level is about 350 feet. Geologically, the lake basin is of recent glacial origin. The shore is composed of a ledge of shale with poorly developed subaqueous terraces which drop sharply away from the littoral zone. This rocky substrate does not foster the growth of the larger aquatic plants as is evidenced by a few patches of *Potamogeton* sp. and *Vallisneria* sp. in the shallow, protected coves.

Chemical analysis of the lake water, according to Juday (1932), showed the surface water to be alkaline (pH 7.2-8.6) and the water at the lower depths neutral. Dissolved oxygen was abundant at all levels (8.8-12.1 mg/l), approaching within 90 percent of saturation. Bound carbon dioxide was not particularly high, with 9-10 mg/l. Nitrate nitrogen varied from .012-.05 mg/l, with the higher concentrations being found at the 40-meter level. Soluble phosphorus ranged from .002 mg/l at the surface to .018 mg/l at the lower levels, while the calcium content varied slightly from 5.0-6.0 mg/l. Secchi disc readings ranged from 4.5 to 8.6 meters.

From the standpoint of lake typology, the physical and chemical data gained from the Juday expedition indicate that Karluk Lake is a classic example of an oligotrophic lake (namely, low in electrolytes, a homogeneously high dissolved oxygen content, deep lake basin, etc.). Since, however, no biological indices have been used for establishing the trophic status of this lake, it seemed pertinent to apply the recent hypothesis of Nygaard (1949) as a means of

determining its trophic level. This hypothesis, referred to as the phytoplankton, or compound coefficient, holds that the ratio between the total numbers of Desmidiaceae and those of other discrete phytoplankton groups can be used as an index to trophic types. It states that if the ratio, or compound coefficient, is one or less, oligotrophy is indicated, while values of one or more generally show an eutrophic situation. The quotient may be derived from the following formula:

$$\text{Compound quotient} = \frac{\text{Myxophyceae} + \text{Chlorococcales} + \text{Centrales} + \text{Euglenales}}{\text{Desmidiaceae}}$$

Quotients were determined from 28 collections of phytoplankton; one or more for each month of the year. In general, it was found that the spring values were lower, with a mean of 0.44, while those of the late fall and winter were slightly higher with a mean of 0.75. During the summer the coefficients were somewhat erratic, varying from 0.07 to 11.0. The latter figure, which indicates an advanced degree of eutrophy, was brought about by a slight pulse of *Cyclotella bodanica*. Most of the coefficients, however, were well within the limits of oligotrophy as defined, and the median value for the 28 collections was 0.74. From available knowledge it would appear that this method of lake classification is valid for Karluk Lake.

THE PHYTOPLANKTON

The total number of species and varieties of algae found in these collections was 255, representing 84 genera. The percentage composition of these according to plant groups is as follows:

Algal groups	Species and varieties	Percent of the total
Diatomaceae	166	65.1
Chlorophyta	56	21.9
Cyanophyta	19	7.5
Chrysophyta	10	3.9
Pyrrophyta	4	1.6

Quantitatively, the percentage values for the total numbers of phytoplankters from the 46 collections differed somewhat from those of the species and varieties composition. In order of dominance they are listed as follows: Diatomaceae 84.8%, Chlorophyta 12.4%, Chrysophyta 2.1%, Pyrrophyta 0.4%, and Cyanophyta 0.2%. The principal component of the phytoplankton, the diatoms, was represented most frequently by the following species, in order: *Asterionella formosa*, *Tabellaria flocculosa*, *Fragilaria crotonensis*, and *Cyclotella bodanica* and varieties. The Chlorophyta, second in abundance, were comprised mostly of *Dictyosphaerium pulchellum*, *Sphaerocystis Schroeteri*, and the desmids *Staurastrum* spp., *Staurodesmus* spp., and *Cosmarium* spp. Also present, though fewer in numbers, were *Ankistrodesmus falcatus* and *Scenedesmus* spp. The most frequently appearing member of the Chrysophyta was *Salpingoeca frequentissima*, a small epiphyte of *Asterionella formosa*. In this group were also found *Dinobryon* spp. and *Mallomonas* spp., the latter appearing mostly in the fall and winter catches. Both the Pyrrophyta and Cyanophyta were represented by two dominant genera; these were, respectively, *Ceratium* and *Peridinium*, and *Anacystis* and *Oscillatoria*.

Listed below is the catalogue of species compiled from the collections.

With the exception of those entities prefixed by an asterisk, all of these species are assumed to be new records for both Karluk Lake and Alaska. This assumption is based on previous algological work done in Alaska by Saunders (1903), Lowe (1923), Juday and others (1932), Hooper (1947), and Croasdale (1956, 1957, 1958).

An impression of average relative abundance is indicated, as suggested by Croasdale (1955), as follows: 'ccc' dominant in every slide; 'cc' present in nearly every low-powered field; 'c' many specimens seen; 'r' only a few specimens seen; and 'rr' only one or two specimens seen.

CATALOGUE OF SPECIES

CHLOROPHYCEAE

CHLOROCOCCALES

- Actinastrum gracillimum* G. M. Smith—rr
Ankistrodesmus falcatus (Corda) Ralfs—c
A. falcatus var. *mirabilis* (W. & W.) G. S. West—rr
Coelastrum cambricum Archer—r
C. microsporum Näg.—r
Crucigenia fenestrata Schmidle—rr
C. rectangularis (A. Br.) Gay—r
Dictyosphaerium Eherenbergianum Näg.—c
D. pulchellum Wood—c
Micractinium pusillum var. *elegans* G. M. Smith—rr
 **Pediastrum Boryanum* (Turp.) Men.—c
 Reported from Alaska by Hooper (1947).
P. Boryanum var. *brevicorne* A. Br.—c
P. Boryanum var. *longicorne* Rac.—c
P. Boryanum var. *undulatum* Wille—r
P. duplex Meyen—rr
P. duplex var. *clathratum* (A. Br.) Lagerh.—rr
Quadrigula lacustris (Chod.) G. M. Smith—rr
Scenedesmus armatus var. *major* G. M. Smith—r
S. bijuga (Turp.) Lagerh.—c
S. dimorphus (Turp.) Kütz.—r
S. ecornis (Ralphs) Chod.—r
S. helveticus Chod.—r
S. obliquus (Turp.) Kütz.—c
S. opoliensis Richter—r
S. quadrecauda var. *longispina* (Chod.) G. M. Smith—r
S. quadrispinus Chod.—c
S. Westii (Smith) Chod.—r
Tetraëdron minimum (A. Br.) Hansg.—rr
Tetradesmus elegans Playfair—rr

DESMIDIALES

Most of the species listed herein have been either described or identified by Dr. Hannah Croasdale of Dartmouth College. Those species prefixed by a single asterisk are listed in her earlier works (Croasdale, 1956; 1957), while those with a double asterisk were described or identified from specimens provided from Karluk Lake by the writer (Croasdale, 1958).

- Closterium* sp.—rr
 ***Cosmarium botrytis* Men. var. *paxillospor-um* W. & G. S. West—r
 ***C. norimbergense* var. *Boldtii* Messik—r
 ***C. phaseolus* Bréb. var. *alaskana* Croasdale—c
 **C. pyramidatum* Bréb.—rr
 ***C. subrenatum* Hansch—r
Gonatozygon Kinakani (Arch.) Rabh.—r
Pleurotaenium sp.—rr
 ***Spondylosium planum* (Wolle) W. & G. S. West—c
 ***S. planum* (Wolle) W. & G. S. West var. *alaskanum* Croasdale—r
 **Staurodesmus cuspidatus* (Bréb.) Teiling f. *alsakanus* Croasdale—r
 **S. dejectus* (Bréb.) Teiling—r
Staurastrum granulolum (Ehr.) Ralfs—rr
 ***S. lunatum* Ralfs var. *planctonicum* W. & G. S. West—cc
S. mucronatum Ralfs var. *subtriangulare* W. & G. S. West—rr
 ***S. pendulum* Nygaard var. *pinguiforme* Croasdale—c
 ***S. petsamoense* Järfelt var. *minus* f. *karlukense* Croasdale—c
 ***S. sebaldi* Reinch var. *impar* Croasdale—r
S. alternans Bréb.—rr

OEDOGONIALES

Bulbochaete spp. sterile—c

TETRASPORALES

- Chlorangium stentorinum* (Ehr.) Stein—rr
Gloeocystis gigas (Kütz.) Lagerh.—r
Sphaerocystis Schroeteri Chod.—c

Oedogonium spp. sterile—r

- Tetraspora cylindrica* (Wahl.) Ag.—c
T. gelatinosa (Vauch.) Desv.—r
T. lacustris Lemm.—c

ULOTRICHALES

Microspora stagnorum (Kütz.) Thur.—c*Ulothrix variabilis* Kütz.—c

VOLVOCALES

Chlamydomonas pseudopertyi Pascher—rr*Gonium pectorale* Muell.—rr

ZYGNEATALES

Mougeotia sp.—r*Zygnema* sp.—r*Spirogyra* sp.—r

CHRYSTOPHYCEAE

HETEROTRICHALES

Tribonema spp.—c

CHRYSOMONADALES

Dinobryon bavarium Imhof—r*M. producta* (Zach.) Iwanoff—c*D. social* var. *americanum* (Brun.) Bachm.*Salpingoeca frequentissima* (Zach.) Lemm.

—r

—c

Euglena volvox Ehr.—rr*Sphaeroeca volvox* Ltb.—rr*Hyalobryon mucicola* Pascher—c

On the basis of available data (cf. Smith, 1950), the above two genera have hitherto not been reported from the United States and, presumably, North America.

This species occurred in the fall and winter plankton, attached to other algae.

Mallomonas caudata Iwanoff—c*Synura uvella* Ehr.—rr*M. gracillima* Conrad—c

DINOPHYCEAE

The following listed *Peridinium* were identified by Dr. Rufus H. Thompson of the University of Kansas.

Ceratium hirundinella (O.F.M.) Schrank—c*P. volzii* Lemm.—r*Peridinium aciculiferum* (Lemm.) Lemm.—c*P. williei* Huift.—Kaas—c

MYXOPHYCEAE

With the exception of *Chroococcus* and *Merismopedia*, all other coccoid forms listed were identified by Dr. Francis Drouet of the Chicago Natural History Museum. Those prefixed by an asterisk have been previously reported from Alaska by Drouet and Daily (1956) from specimens provided by the writer.

Anacystis incerta (Lemm.) Dr. & Daily—r*Merismopedia glauca* (Ehr.) Näg.—r**A. montana* f. *minor* (Wille) Dr. & Daily*M. punctata* Meyen—r

—c

M. thermalis Kütz.—rr*A. nidulans* (Richt.) Dr. & Daily—r*Oscillatoria rubescens* DC.—r*A. thermalis* f. *major* (Lagerh.) Dr. & Daily*O. sancta* (Kütz.) Gom.—r

—r

O. tenuis Ag.—c*Chroococcus limneticus* Lemm.—r*Spirulina* sp.—r*C. minutus* (Kütz.) Näg.—r

A preliminary examination of this alga suggests that it might be *S. Corakiana* Playfair.

**Clastidium setigerum* Kirchner—r*Tolypothrix distorta* Kütz.—rr*Coelosphaerium Kuetzingianum* Näg.—c*T. lanata* Wartm.—rr*Gomphospheria lacustris* Chod.—r*Lyngbya Diguetii* Gom.—r*L. purpurea* (Hook. & Harv.) Gom.—r

DIATOMACEAE

The following list of diatoms was prepared by Dr. Emile Manguin of the Muséum National, Paris, France. In addition, he has added a few notes on the restricted geographic occurrence of some of the Old World species indigenous to Karluk Lake. Missing from the list are 15 species and varieties which Dr. Manguin will describe in a subsequent publication. The writer has assigned a relative abundance to the various species based on information provided by Dr. Manguin. Species prefixed by an asterisk have been cited previously from Karluk Lake by Juday (1932); those with a double asterisk were observed by Saunders (1903) from Kodiak Island.

Achnanthes affinis Grun.—rr*A. flexella* (Kütz.) Brun.—rr*A. austriaca* Hust.—rr*A. kryophila* B. Peterson var. *densestriata* Hust.—rr

Alpine and north-alpine of Europe.

This form is localized in alpine lakes of Europe.

A. calcar Cleve—r

North-alpine of Europe.

- A. lanceolata* Bréb.—c
A. lapponica Hust.—r
 Restricted to north-alpine in Europe.
A. laterostrata Hust.—c
 Alpine lakes and Finland.
A. linearis W. Smith—r
A. linearis var. *pusilla* Grun.—r
A. minutissima Kütz.—cc
A. minutissima vra. *cryptocephala* Grun.—cc
A. obliqua (Greg.) Hust.—r
 Occurs north of western Europe; also in Russian and Finnish lakes.
A. Suchlandtii Hust.—r
 In alpine lakes of Europe.
 **Amphora ovalis* Kütz.—c
A. ovalis var. *pediculus* Kütz.—c
A. perpusilla Grun.—r
Anomoenoeis exilis (Kütz.) Cleve—r
Asterionella formosa Hass.—ccc
Caloneis bacillum (Grun.) Meresch.—r
C. Schumanniana (Grun.) Cleve var. *bi-constricta* Grun.—r
C. silicula (Ehr.) Cleve var. *tumida* Hust.—r
Campylodiscus noricus Ehr. var. *bibernica* (Ehr.) Grun.—r
 **Ceratoeis arcus* Kütz.—cc
C. arcus vra. *amphioxys* Rabh.—cc
C. arcus var. *linearis* Holmboe—r
 **Cocconeis pediculus* Ehr.—c
 **C. placentula* Ehr.—c
 **Cyclotella bodanica* Eulenst.—ccc
C. bodanica var. *lemanensis* O. Müll.—ccc
 This particular form occurs in subalpine lakes of the northern regions of Europe; also in certain of the Canadian lakes.
C. comensis Grun.—cc
C. comta (Ehr.) Kütz.—c
C. Meneghiniana Kütz.—c
C. ocellata Pant.—c
C. pseudostelligera Hust.—c
C. stelligera Cleve & Grun.—r
Cymbella aequalis W. Smith—rr
C. affinis Kütz.—r
C. cistula (Hempt.) Grun.—c
 **C. cistula* var. *maculata* (Kütz.) v. Heurk—r
C. Clericii Frenguel., forma—r
 Indigenous to South America, probably Patagonia.
C. cymbiformis (Ag. ?Kütz.) v. Heurk—r
C. gracilis (Rabh.) Cleve—r
C. lanceolata (Ehr.) v. Heurk—r
C. microcephala Grun.—c
C. prostrata (Berk.) Cleve—r
C. prostrata var. *robusta* Cleve—r
C. sinuata Greg.—c
C. tumida (Bréb.) v. Heurk—c
C. tumidula Grun.—r
C. turgida (Greg.) Cleve—ccc
 **C. ventricosa* Kütz.—c
C. ventricosa var. *silesiaca* (Bleisch) Cleve—r
Cymbellonitzschia diluviana Hust.—r
 Characteristic of postglacial Quaternary alluvion in Europe.
Diatoma elongatum Ag.—r
D. hiemale (Lyngb.) Heib., var. *mesodon* (Ehr.) Grun.—c
D. vulgare Bory, var. *grandis* (W. Smith) Grun.—r
D. vulgare var. *producta* Grun.—r
Didymosphenia geminata (Lyngb.) M. Schmidt—c
 North-alpine and alpine in Europe, North America, and Siberia (Kamchatka).
Diploneis elliptica (Kütz.) Cleve—c
D. ovalis (Hilse) Cleve—cc
D. Smithii (Bréb.) Cleve—c
Epithemia sorex Kütz.—r
 **E. turgida* (Ehr.) Kütz.—r
E. turgida var. *granulata* (Ehr.) Grun.—r
 **E. zebra* (Ehr.) Kütz., var. *saxonica* (Kütz.) Grun.—r
Fragilaria bidens Heiberg, f. *major*—cc
F. brevistriata Grun.—r
F. capucina Desmaz.—r
F. capucina var. *mesolepta* (Rabh.) Grun.—c
 **F. construens* (Ehr.) Grun.—r
F. construens var. *biceps* Störe—r
F. construens var. *binodis* (Ehr.) Grun.—rr
F. construens var. *venter* (Ehr.) Grun.—r
F. crotonensis Kit.—ccc
 Reported from Alaska by Hooper (1947).
F. leptostauron (Ehr.) Hust.—r
F. pinnata Ehr.—cc
F. pinnata var. *lancettula* (Schum.) Hust.—r
F. Vaucheriae (Kütz.) B. Petersen—c
F. Vaucheriae var. *capitellata* Grun.—c
F. virescens Ralfs—r
Gomphonema acuminatum Ehr., var. *coronata* (Ehr.) W. Smith—r
G. angustatum (Kütz.) Rabh.—r
G. angustatum var. *producta* Grun.—r
G. angustatum var. *sarcophagus* (Greg.) Grun.—r
 **G. constrictum* Ehr.—c
G. constrictum var. *capitata* (Ehr.) Cleve—r

- G. eriense* Grun.—r
Regarded as a form of *G. herculeanum* in North America.
- G. gracile* Ehr.—r
- **G. herculeanum* Ehr.—c
Found in both North America and Siberia (Kamchatka).
- G. herculeanum* var. *clavatum* Cleve—r
- G. herculeanum* var. *robustum* Grun.—r
- G. herculeanum* var. *septiceps* M. Schmidt—r
- G. intricatum* Kütz., var. *pumila* Grun.—r
- G. olivaceoides* Hust.—r
- G. olivaceum* (Lyngb.) Kütz.—r
- G. parvulum* Kütz.—r
- G. ventricosum* Greg.—c
Found in North America, Kamchatka, and Scandinavia.
- Gyrosigma attenuatum* (Kütz.) Rabh.—r
- **Hantzschia amphioxys* (Ehr.) Grun.—r
- **Melosira arenaria* Moore—r
- M. distans* (Ehr.) Kütz.—cc
- M. distans* var. *lirata* (Ehr.) Bethge—r
- **M. italica* (Ehr.) Kütz.—cc
- **M. varians* Ag.—r
- **Meridion circulare* Ag.—c
- Navicula cocconeiformis* Greg.—r
- N. cryptocephala* Kütz.—c
- N. cryptocephala* var. *intermedia* Grun.—c
- N. cryptocephala* var. *veneta* (Kütz.) Grun.—cc
- N. cuspidata* Kütz.—r
- N. disjuncta* ?Hust.—r
- N. farta* Hust.—r
- N. hungarica* Grun., var. *luneburgensis* Grun.—r
- N. lanceolata* (Ag.) Kütz.—r
- N. menisculus* Schum.—r
- N. peregrina* (Ehr.) Kütz., var. *meniscus* Grun.—r
- N. pseudoscutiformis* Hust.—r
- N. pupula* Kütz., var. *rectangularis* (Greg.) Grun.—rr
- N. radiosa* Kütz.—c
- N. Reinhardtii* Grun., var. *gracilior* Grun.—r
- N. Reinhardtii* var. *striolata* Mayer—r
- N. Schonfeldii* Hust.—r
- N. semen* Ehr.—r
Postglacial Quaternary alluvion.
- N. vulpina* Kütz.—c
- Nitzschia acicularis* W. Smith, var. *major* O. Müll.—r
- N. angustata* (W. Smith) Grun.—c.
- N. fonticola* Grun.—c
- N. frustulum* Kütz.—r
- N. frustulum* var. *perpusilla* (Rabh.) Grun.—c
- N. gracilis* Hantz.—r
- **N. palea* (Kütz.) W. Smith—r
- N. signoidea* (Ehr.) W. Smith—r
- Opephora Martyi* Hérib.—rr
- Pinnularia appendiculata* (Ag.) Cleve—r
- P. gibba* Ehr.—r
- P. microstauron* (Ehr.) Cleve—r
- P. streptorapha* ?Cleve—r
- P. viridis* f. (Nitz.) Ehr.—r
- Rhizosolenia longiseta* Zach.—r
- **Rhoicosphenia curvata* (Kütz.) Grun.—cc
- Stauroneis anceps* Ehr.—r
- ***S. phoenicenteron* Ehr.—r
- Stephanodiscus astraea* (Ehr.) Grun., var. *intermedia* Fricke—r
- S. astraea* (Ehr.) Grun., var. *minutula* (Kütz.) Grun.—cc
- **S. niagarae* Ehr.—ccc
Found in North America; planktonic form in certain large Canadian lakes.
- S. niagarae* var. *magnifica* Fricke—r
- S. niagarae* var. *magnifica* Fricke f. *minor*—r
- Surirella biseriata* Bréb.—r
- S. biseriata* Bréb., var. *bifrons* (Ehr.) Hust., f. *punctata* Meist.—r
- S. linearis* W. Smith., var. *constricta* (Ehr.) Grun.—r
- S. linearis* W. Smith., var. *helvetica* (Brun.) Meist.—r
- **S. robusta* Ehr.—r
- S. tenera* Greg. f.—r
- Synedra acus* Kütz.—r
- S. acus* Kütz., var. *angustissima* Grun.—c
- S. amphicephala* Kütz., var. *austriaca* Grun.—r
- S. nana* Meist.—r
- S. rumpens* Kütz.—c
- S. rumpens* Kütz., var. *familiaris* Grun.—r
- S. rumpens* Kütz., var. *neogena* ?Grun.—r
- S. rumpens* Kütz., var. *scotica* Grun.—r
- **S. ulna* (Nitz.) Ehr.—cc
- S. ulna* var. *danica* (Kütz.) Grun.—cc
- Tabellaria fenestrata* (Lyngb.) Kütz.—c
- **T. flocculosa* (Roth) Kütz.—ccc

DISCUSSION

In recent years it has come to the writer's attention that surprisingly little has been published on arctic and subarctic fresh-water plankton as it exists during the winter seasons. The available reports stem principally from the

efforts of European workers such as Olafsson (1918), Ström (1923, 1926), and Rhode (1955). In Alaska it would appear that biologists, principally those concerned with fisheries, are predisposed to *a priori* reasoning that biological productivity is nil during the late fall and winter. To illustrate, the party under Juday which investigated Karluk Lake over a four-year period (Juday and others, 1932), did so during the summer months, from mid-July to mid-September. This, in effect, represented two months or 16.7 percent of the year during which the plankton was taken into consideration. Presumably, such data as were gained during this brief period have been used as the sole basis for determining lake productivity as related to salmon fisheries. It is apparent from the available data that sampling over such a limited period can give misleading concepts of plankton populations.

During the course of their investigation, the Juday group found an average of 17,963 diatoms (all values given here are numbers of organisms per liter) at their No. 2 station, and a maximum count, taken July 21, 1927, of 67,424. They indicated further that optimal numbers of diatoms were found during July and that numbers usually decreased by the beginning of September. By comparison, the writer found during the summer of 1956 that the average number of diatoms was 14,420, a maximum of 27,800 occurring on July 25. The counts remained comparatively low, about 1,700, from August 16 until September 22. From that date until December 10, when the lake became completely covered with ice, the average number of diatoms rose to 34,500, and the maximum for the season was 70,975, observed on October 15. Concurrent with the late fall increase in phytoplankton productivity, the writer found that the Entomostracan population also showed a significant rise over that of the summer and early fall. For example, *Cyclops scutifer* Sars averaged 0.6 during the summer months through the middle of September, but from this time until the lake surface was frozen over, an average of 11 was sustained. Even more interesting was the fact that 48 hours before the freezing of the lake, the maximum number of 101 individuals was recorded. The Juday records show a copepod maximum, for the four-year period, of 37.6 occurring on September 7, 1929.

As an adjunct to observations made on the fall and winter plankton at Karluk Lake, another example of winter plankton abundance was demonstrated on February 28, 1958, when the writer visited an unnamed alpine lake, at 62° 41' N 147° 48' W. Here a hole was cut through about three feet of ice, and large numbers of copepods were observed in the overflow. To avoid the possibility that light attracted these organisms, another hole was made several hundred feet from the original opening at dusk, and a sample collected after dark. A quantitative examination of this sample revealed over 3,300 *Cyclops* sp. per liter. A re-examination of this lake in June showed that it was slightly dystrophic, and a plankton tow indicated a paucity of organisms. At this time the copepod count was about 12 per liter.

With reference to the aforementioned examples of late autumnal and winter maxima, it may be argued that these phenomena are a normal sequence of stenotopic (oligothermal) organisms making their appearance as the water

temperatures decrease. However true this may be, there is a paucity of data on the seasonal biological rhythms of the plankton in Alaskan lakes. Until adequate information is available, it behooves biologists to exercise caution in making recommendations for lake management relating to fisheries in Alaska on the basis of existing published data on phytoplankton.

ACKNOWLEDGMENTS

The writer wishes to express his thanks to Mr. Kim Clark, Refuge Biologist, U.S. Fish and Wildlife Service, Kodiak, Alaska, for his valuable field assistance. Thanks, too, is given the following authorities for their contributions, wholly, or in part, in identifying the algae listed in the catalogue of species: Dr. Emile Manguin, the diatoms; Dr. Francis Drouet, the coccoid myxophyceae; Dr. Hannah Croasdale, the desmids; and Dr. Rufus H. Thompson, the dinoflagellates.

The writer is indebted to the following staff members of Arctic Health Research Center, for their critical review of the manuscript: Dr. Robert L. Rausch, Dr. William Frohne, and Mr. Francis S. L. Williamson.

ADDENDUM

In making a recent examination of the plankton from Karluk Lake, Dr. Berit Asmund of Snekkersten, Denmark, found, when using the electron microscope, that what the writer has listed as *Hyalobryon mucicola* Pascher may very well be *Hyalobryon polymorphum* Lund. In addition, she also observed *Mallomonas acaroides* var. *crassisquama* Asmund, *Mallomonas elongata* Reverdin, and *Mallomonas pseudocoronata* Prescott, all of which had not previously been recorded by the writer.

REFERENCES

- CROASDALE, H. 1956. Freshwater algae of Alaska. II. *Actinotaenium*, *Micrasterias* and *Cosmarium*. Trans. Amer. micr. Soc. 75:1-70.
- . 1957. Freshwater algae of Alaska. I. Some desmids from the interior. Part 3: *Cosmaria* concluded. Trans. Amer. micr. Soc. 76:116-158.
- . 1958. Freshwater algae of Alaska 2. Some new forms from the plankton of Karluk Lake. Trans. Amer. micr. Soc. 77:31-35.
- DROUET, F., and W. DAILY. 1956. Revision of the coccoid myxophyceae. Butler Univ. bot. Stud. 12:1-218.
- HOOPER, F. F. 1947. Plankton collections from the Yukon and Mackenzie river systems. Trans. Amer. micr. Soc. 66:74-84.
- JUDAY, C., and others. 1932. Limnological studies of Karluk Lake, Alaska, 1926-1930. Bull. U.S. Bur. Fish. 47:407-426.
- LOWE, C. W. 1923. Freshwater algae and freshwater diatoms. Rep. Canadian Arctic Exped. 1913-1918, IV (Bot. A):1-53A.
- NYGAARD, G. 1949. Hydrobiological studies on some Danish ponds and lakes. K. Danske Videnskabernes Selskab. Biol. Skr. 7:1-293.
- OLAFSSON, O. 1918. Studien über die Süswasserfauna Spitzbergens. Zool. Bidr. Uppsala 6:183-646.
- RODHE, W. 1955. Can plankton production proceed during winter darkness in sub-arctic lakes? Verh. int. Ver. Limnol. 12:117-122.
- SAUNDERS, DE A. 1903. Papers from the Hariman Alaska expedition, 25. The algae. Proc. Wash. Acad. Sci. 5:155-211.
- SMITH, G. S. 1950. The fresh-water algae of the United States. 2d ed. New York, McGraw-Hill.
- STRÖM, K. M. 1923. The alga-flora of the Sarek Mountains. Naturw. Untersuch. Sarekgeb. 3:437-521.
- . 1956. Norwegian mountain algae; an account of the biology, ecology and distribution of the algae. Norske Vidensk.-Akad. I. Mat.-naturvidensk. Kl. 6:1-264.

THE DOG-STRANGLING VINE *CYNANCHUM MEDIUM*, ITS CHROMOSOME NUMBER AND ITS OCCURRENCE IN CANADA*

RAYMOND J. MOORE

Botany and Plant Pathology Laboratory, Ottawa, Ontario

A RATHER distinctive herbaceous vine has been collected frequently from two localities in Ontario: Ottawa and Toronto. The vine is an introduced member of the milkweed family (Asclepiadaceae) and it has been commonly identified as *Cynanchum nigrum* (L.) Pers. The generic name is derived from the Greek words for 'dog' and 'to strangle'. An old meaning of 'strangle' is 'to kill by poison' so the common name presumably suggests that dogs may be poisoned rather than physically strangled by the vine. This identification of the local vine represents the only possible disposition of the plant according to the keys found in manuals in common use. However, many botanists have been aware that the Ontario vine does not fit perfectly the description of the species *nigrum*.

Recently Monachino (1957) has collected in the New York City area a vine which he has identified as *Cynanchum medium* R.Br. The description of that species has been found to fit the Ontario plant, an opinion with which Monachino in a personal communication concurs.

It is the purpose of this note to record the occurrence of *C. medium* in Canada and to report for the first time the chromosome number of the species. Herbarium specimens previously determined as *C. nigrum* have been examined and revisions in the Canadian distribution of this species have been made.

The species *nigrum* and *medium* are very similar in habit and foliage but can be distinguished with certainty by floral characters.

In *C. nigrum* the corolla lobes are dark purple, broadly deltoid, as long as broad (1 mm), rather fleshy, the inner surface covered with papillae from which arise short hairs. The staminal crown is inconspicuously 5-lobed. The flowers are borne in umbel-like clusters (6-10) on peduncles (1 cm) arising in the axils of the leaves.

C. medium has the corolla lobes maroon or pinkish, lanceolate, at least twice as long as broad (2 mm x 4-5 mm), not fleshy, glabrous within. The crown is deeply 5-lobed, the lobes being united only at the base. The flowers of this species are borne as in *C. nigrum*, in fascicles on axillary peduncles 2-5 cm long. The number of flowers on a peduncle is variable but tends to be greater than in *C. nigrum* and often the cluster appears to be compound.

Two adventive species of *Cynanchum*, *C. vincetoxicum* (L.) Pers. and *C. nigrum* (L.) Pers. have previously been reported to occur in northeastern North America (Fernald, 1950).

The three species are native to Europe. *Cynanchum vincetoxicum* is widespread in continental Europe, extending southwards as far as the northern portions of Spain, Italy and the Balkans and eastwards into European Russia (Hegi, 1927). *Cynanchum nigrum* is widespread in southern Europe: from Portugal, southern France and Italy, eastwards to central and southern Russia and the Caucasus (Schumann, in Engler and Prantl, 1891; Ledebour, 1847-49).

*Contribution No. 1712 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.



Herbarium specimens of (Figure 1) *Cynanchum medium* R.Br. Ottawa, Ontario, and (Figure 2) *Cynanchum nigrum* (L.) Pers. Peoria County, Illinois.

Robert Brown (1809) described *C. medium* from a plant cultivated in the Paris Botanic Garden. This species seems to be absent from western Europe but has been reported from Turkey (Nyman, 1878-82) southern Russia (Ukraine) and the Caucasian republics (Ledebour, 1847-49). The occurrence of *C. medium* in southern Europe reported by Decaisne (*in de Candolle*, 1844) seems questionable.

These species have been transferred to the genus *Vincetoxicum* Mönch and consequently appear in floras under the following names: *Cynanchum vincetoxicum* (L.) Pers. or the synonym *Vincetoxicum officinale* (L.) Moench; *C. nigrum* (L.) Pers. or *V. nigrum* (L.) Moench; *C. medium* R. Br. or either of the two synonyms *V. nigrum* (R. Br.) Dcne., *C. medium* (Dcne.) K. Sch.

The three species can be readily separated by the use of the following key.

- Flowers greenish white.....*C. vincetoxicum* (L.) Pers.
- Flowers purplish.....*C. medium* R.Br.
- Corolla lobes elliptic-lanceolate, twice as long as broad, glabrous within.....*C. nigrum* (L.) Pers.
- Corolla lobes deltoid, as broad as long, fleshy, papillate and pubescent within.....*C. medium* R.Br.

Although not as reliable as the floral characters, the greater length of the flower peduncle is a character of value in the identification of fruiting specimens that no longer bear fresh flowers. The pods of *C. medium* stand out about one inch from the stem whereas those of *C. nigrum* lie close to the twining stem, among the foliage. This character can be seen by comparing the illustrations of the specimen of *C. medium* (Figure 1) from Ottawa, Ontario, with that of *C. nigrum* (Figure 2) from Peoria County, Illinois.

Specimens of *Cynanchum* in the herbarium of the Department of Agriculture, Ottawa (DAO), and in the National Herbarium of Canada (CAN) have been examined and collections of *C. medium* from three localities in Canada were found.

The oldest Canadian collection of *C. medium* was made in 1885 at Victoria, B.C. (J. Fletcher, May, 1885, cultivated grounds, Victoria, B.C. Geol. Survey No. 16054—CAN). No later collections from this locality are available in Ottawa and the British Columbia Provincial Museum contains no specimens of *Cynanchum*. The existence of the vine in Victoria is not known to the present curator, Dr. Szczawinski (personal communication). It seems therefore that the introduction did not persist in British Columbia.

At Toronto, Ontario, *C. medium* was first collected by Mrs. A. G. White on Sept. 21, 1889, at Toronto Junction (DAO) and has subsequently been found in that area many times. Collections have been made in the intervening years at Wexford, a district originally northeast of the city of Toronto but now included in the expanding metropolitan area and located at the intersection of Victoria Park Avenue and Lawrence Avenue East. In a survey made at that point by W. G. Dore in August 1957 the vine was found to be flourishing along a railroad embankment, in fence rows and through adjacent maple, beech, oak and ash woods. The wooded area is being rapidly destroyed for building projects and the future of the vine here is uncertain.

At Ottawa the vine has been present for at least 25 years in and about the Dominion Arboretum and Botanic Garden. The first collection from this area was made in 1931 (Ritchie, July 16, 1931, Chemistry Bldg., Central Experimental Farm—DAO) and the plant was found at the same locality in July 1957. It now persists tenaciously in the Central Experimental Farm area on hedges and in ornamental beds within a radius of about half a mile from the Chemistry Building.

After a revision of the identity of the available specimens it appears that *Cynanchum nigrum* is represented in Canada by only one collection: from Montreal (Frère Martin Fillion, Aug. 2, 1949, near Arboretum of Notre Dame College, Côte des Neiges—DAO).

The chromosome number of *C. medium* R.Br. has been determined from plants growing in the Dominion Arboretum and adjacent areas in Ottawa and also from a living plant brought from the Toronto infestation. In all cases, the number $2n=22$ was found.

The chromosome numbers of the related species have been reported by Pardi (1933) as *C. nigrum* Pers., $2n=44$; *C. vincetoxicum* Pers., $2n=22$. The difference in chromosome number of the two species *nigrum* and *medium* is an important differentiating feature. This difference supported the long-held suspicion that the vine growing at Ottawa was not *C. nigrum*, as formerly classified.

REFERENCES

- BROWN, R. 1826. Über die Asclepiadeen, eine natürliche Pflanzenfamilie. In C.G. mischte botanische Schriften. Vol. 2. p. 385. Leipzig, F. Fleischer.
Nees von Esenbeck, Robert Brown's ver-

- DE CANDOLLE, A. 1844. *Prodromus systematis naturalis regni vegetabilis*. Vol. 8. Paris, Fortin, Masson.
- ENGLER, A., and K. PRANTL. 1891. *Die natürlichen Pflanzenfamilien*. Vol. 4 (1). Leipzig, W. Engelmann.
- FERNALD, M. L. 1950. *Gray's Manual of Botany*. 8th Edition. New York, American Book Co.
- HEGI, G. 1927. *Illustrierte Flora von Mitteleuropa*. Vol. 5(3). Munich, J. F. Lehmanns.
- LEDEBOUR, C. F. 1847-49. *Flora Rossica*. Vol. 3(1). Stuttgart, E. Schweizerbart.
- MONACHINO, J. 1957. *Cynanchum* in the New York area. *Bull. Torrey bot. Cl.* 84: 47-48.
- NYMAN, C. F. 1878-1882. *Conspectus florae Europae*. Orebro.
- PARDI, P. N. 1933. Studi sulla carilogia delle Asclepiadaceae. *Nuovo bot. ital.* N.S. 40:576-589.

Received for publication 16 July 1958



SOME INFLORESCENCE FORMS IN CLOVERS AND OTHER LEGUMES*

WILLIAM G. DORE

Botany and Plant Pathology Laboratory, Ottawa, Ontario

FROM TIME to time farmers and naturalists notice peculiarly modified flowers on the clovers and other leguminous plants with which they are familiar. Sometimes the plant may be picked out of curiosity and sent to a plant pathology station for explanation. When no fungal or insect parasites can be found on the sample, the plant may be referred to the general botanist for opinion. A brief annotation on a herbarium specimen—"freak", "teratological specimen", "proliferated flower", "monstrosity", etc.—is often the only record of his opinion we have.

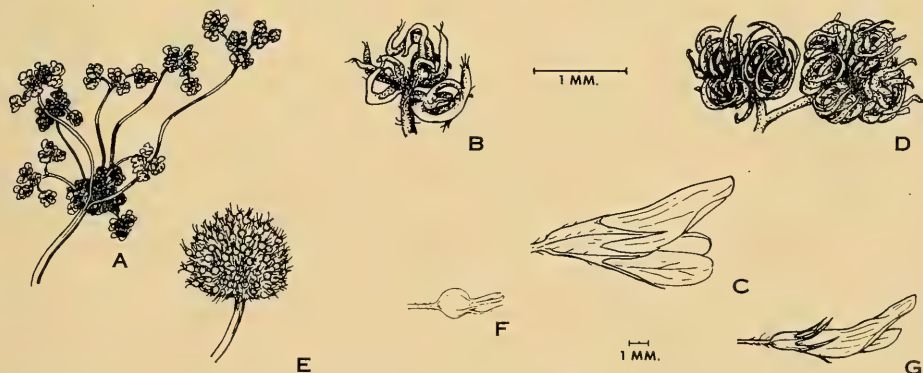


FIGURE 1. A, 'cauliflower' inflorescence of *Trifolium hybridum* (natural size); B, a single glomerule of 'cauliflower' inflorescence of *Medicago sativa* ($\times 15$); C, normal floret of *Medicago sativa* ($\times 3$); D, two glomerules of 'cauliflower' inflorescence of *Trifolium hybridum* ($\times 15$); E, 'onion' inflorescence of *Trifolium hybridum* (natural size); F, single floret of 'onion' inflorescence of *Trifolium hybridum* ($\times 3$); G, normal floret of *Trifolium hybridum* ($\times 3$).

*Contribution No. 1747 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.

It is the purpose of this paper to describe and record the occurrence of some of these "abnormal" specimens and in those instances where it appears that the unusual condition is consistent with an internal, or genetic, cause, to assign a formal name to the variant. In all, three groups of floral modification may be discussed: 'cauliflower' inflorescence, 'onion' inflorescence, and 'phyllody' (Figure 1).

'CAULIFLOWER' INFLORESCENCE

In alfalfa, alsike and sweet clover the usual petaliferous inflorescence may be replaced by a dense mass of pale-colored twisted scales (Figures 2 to 5). The construction of this scaly tissue suggests that the floral meristem had early become hypertrophied and as the result of its repeated and irregular branching the large number of small thickened bracts developed. The bracts show no particular organization except that they are clumped together into more or less discrete glomerules. No fresh specimens have been available but judging from dried specimens and photographs of living plants these glomerules are white or whitish in color, completely devoid of chlorophyll and of any of the bright pigments usually associated with flower color. On dissection nothing analogous to petals or sexual organs can be recognized. The plants consequently are sterile. In some respects the structure parallels that of the head of cauliflower, *Brassica oleracea* var. *botrytis*. Teratologically, the condition would be classified as an example of "bracteomanie" following the scheme of Vuillemin (1926).

On account of the superficial resemblance of the glomerules to galls or to other monstrous growths induced in plant tissues by parasitic insects, fungi and viruses, the possibility of the growth being caused by such external agents must be given consideration. On several specimens of legumes showing 'cauliflower' inflorescence there are annotations to the effect that the plant was growing as a single individual in a field planted to the species. If the condition was due to some infectious agent, it would be expected that several plants would be affected and that the infection would increase in abundance in the field, appearing first in adjacent plants. Microscopic examination shows no sign of fungal or insect parasitism, and no reference appears to be available in the literature to account for the structure as a pathological phenomenon. Herbicides of the hormone type also produce curious growths in plant parts but several of the specimens that have been preserved were collected in years antedating the use of such chemical compounds, so this cause can also be ruled out.

On the other hand, there is some contributory evidence that floral proliferation of the 'cauliflower' type is of genetic origin and results as the rare but normal expression of a recessive gene. Stewart (1934) reported that the

FIGURE 2. Branch of an alfalfa plant with inflorescence composed of glomerules of chlorotic bracts. (Photographed in a field at Gilbert Plains, Manitoba, in 1950 by W. E. Sackston.)

FIGURE 3. Detail of 'cauliflower' inflorescence in *Medicago sativa* specimen from plant shown in Figure 2. Portion of type specimen of *M. sativa* f. *prolifera* W. G. Dore.

FIGURE 4. Portion of type specimen of *Trifolium hybridum* f. *prolifera* W. G. Dore, collected at Lac aux Sables, Quebec, by A. Doré, 1905.

FIGURE 5. Portion of isotype specimen of *Melilotus alba* f. *prolifera* W. G. Dore, collected at Armstrong, British Columbia, by S. R. Noble, 1947.



progeny of certain selfed plants of alfalfa exhibited a condition he described as "a freak mealy vegetative proliferation of the flower" and illustrated with photographs of a plant very similar to that shown in Figure 2. This instance suggests that genes are involved and the experimental finding conforms with the general observation that a recessive character, usually masked in a heterozygous population, has a chance to express itself on close inbreeding. In the tomato plant a sterile proliferous condition, seemingly parallel to that in the legumes, has also been described by Paddock and Alexander (1952) and attributed by them to a recessive mendelian character referred to as 'cauliflower'.

Although proliferated plants undoubtedly constitute an extremely small proportion of the leguminous population, specimens of them have accumulated in institutional herbaria in disproportionate numbers. For example, in the Department of Agriculture herbarium at Ottawa there are for alfalfa 2 cauliflower specimens as against 55 typical specimens, for alsike 5 cauliflower specimens as against 88 typical, and for white sweet clover 1 cauliflower specimen as against 144 typical specimens. The proportion of proliferous plants in nature can be nothing nearly so high as this.

The label data on the specimens, as can be gained from the citations below, indicate that proliferous plants have occurred spontaneously in Canada at widely separated localities with no relationship to climate, soil or season. While no annotations indicate that the proliferous condition is perpetuated from year to year, it is presumed that it is, or could be, by clonal propagation, since the plants are perennial and are otherwise normal. No living plants, however, have been available to test this assumption.

Since it is here considered that the conspicuous and clear-cut variation of 'cauliflower' inflorescence is the normal expression of a genetic factor and not just an abnormality or monstrosity caused by external factors, it is appropriate to assign it systematic status. This may be done by proposing names in the rank of form for each species in which it occurs.

Medicago sativa L. forma **prolifera** f.n. *Inflorescentia mutatur in chloroticum chaos squammarum vestigialium minus millimetro*. Inflorescence replaced by a dense chlorotic mass of rudimentary scales less than 1 mm long.

TYPE SPECIMEN: * Gilbert Plains, Manitoba, in field of registered alfalfa, W. E. Sackston, September 7, 1950 (Figures 1B, 2, 3). OTHER SPECIMENS: Mara, British Columbia, V. A. Stevens, September 1936; Vernon townsite, B.C., garden lot, J. Caplette, July 2, 1951.

Trifolium hybridum L. forma **proliferum** f.n. *Inflorescentia mutatur in chloroticum chaos squammarum vestigialium minus millimetro*. Inflorescence replaced by a dense chlorotic mass of rudimentary scales less than 1 mm long.

TYPE SPECIMEN: Lac aux Sables, Quebec, Alph. Doré, July 28, 1905 (Figures 1A, 1D, 4). OTHER SPECIMENS: Murray Bay, Quebec, F. Lapointe, September

*All specimens cited are preserved in the herbarium of the Department of Agriculture, Ottawa (DAO) except where designated (UBC) University of British Columbia, Vancouver.

15, 1902; Trout Creek, Algoma, Ontario, *Thos. A. Trussler*, August 19, 1909; Plantagenet, Ontario, field near highway, *E. G. Anderson*, July 5, 1946; Beaverlodge, Alberta, a single plant on farm of A. McTavish 25 miles away, *A. C. Carder*, 1951; Kerrisdale, British Columbia, *J. Pollock*, July 24, 1918 (UBC); British Columbia, sent in to office of Plant Pathologist by M. Ruksmann, *J. W. Eastham*, 1920 (UBC); Prince George, British Columbia, one plant growing in seed clover field, *C. Tice*, July 20, 1941 (UBC).

The condition in alsike clover is morphologically identical to that in alfalfa except that the glomerules are often supported on longer, flexuous peduncles.

Melilotus alba Desr. forma **prolifera** f.n. *Flores mutatur in chaos squammarum minus millimetro*. Flowers replaced by a mass of scales less than 1 mm long.

TYPE SPECIMEN: Armstrong, British Columbia, experimental alfalfa plot, only one plant found, *S. R. Noble*, September 19, 1947 (DAO: dupl. UBC) (Figure 5).

Hedysarum mackenzii Richardson forma **proliferum** f.n. *Influorescentia mutatur in chaos squammarum*. Inflorescence replaced by a mass of scales.

TYPE SPECIMEN: North side of Tanana River, Mile 277, Richardson Highway, 64° 10' N, 145° 52' W, Alaska, a single clump in shallow soil over broken rock (growing beside common petaliferous plant, cf. 4983), *W. J. Cody* 4984, June 3, 1951.

Hedysarum mackenzii is a wild legume, native to North America and abundant in much of northwestern Canada. Formae *mackenzii* (*Cody* 4983) and *proliferum* (*Cody* 4984) are compared in Figures 6 and 7.

'ONION' INFLORESCENCE

Another distinctive type of 'abnormality' of the inflorescence found in alsike and white clover resembles somewhat a small umbel of an onion with unopened flowers (Figure 1E). The arrangement of the florets in the raceme is that of the usual headlike inflorescence, but the calyx of each floret is strongly distended (Figure 1F) apparently due to the congestion of the parts within. On dissection of a floret, all the petals and stamens fully formed can be recognized and counted when they are unraveled from their bunched-up and contorted mass. The ovary alone appears to grow unrestrictedly, and its style protrudes well beyond the calyx tube and as far as the tips of the calyx teeth. The stigma appears as if it would be receptive but no seeds have been found forming in any of the heads on herbarium specimens of alsike or in numerous heads on a living plant of white clover that has been examined. In this living plant of white clover the pollen appears to form quite normally and even germinates in the ruptured anthers in contact with the side of the ovary. All heads on this plant have developed similarly through several clonal divisions and no admixture of florets with expanded corollas has occurred.

The 'onion' condition is not mentioned by Erith (1924) in her extensive monograph on white clover and is not known to have been reported before.



FIGURE 6. Inflorescence of *Hedysarum mackenzii* f. *mackenzii*, collected at Tanana River, Alaska, *Cody* 4983, in 1951.

FIGURE 7. Type specimen of *Hedysarum mackenzii* f. *proliferum* W. G. Dore, collected at Tanana River, Alaska, *Cody* 4984, in 1951.

FIGURE 8. Portion of type specimen of *Trifolium hybridum* f. *allioideum* W. G. Dore, collected at Sylvania, Saskatchewan, in 1941, *Breitung* 113 (natural size).

FIGURE 9. A selection of 'heads' of *Trifolium repens* f. *allioideum* W. G. Dore, in different stages of maturity, from a clone of the type plant collected at Ottawa in 1957 (natural size).

The following form names may therefore be proposed for alsike and white clover plants possessing this feature of inflorescence:

Trifolium hybridum L. forma **allioideum** f.n. *Calyx albinus membranaceus, distentus ab appendicibus floralibus; corolla inclusa.* Calyx whitish membranous, distended by the contorted and enclosed inner flower-parts; corolla not exerted.

TYPE SPECIMEN: Sylvania, Saskatchewan, roadside ditch, one such plant found, *A. J. Breitung 1113*, June 21, 1941 (Figure 8).

Trifolium repens L. forma **allioideum** f.n. *Calyx albinus, membranaceus, distentus ab appendicibus floralibus; corolla inclusa.* Calyx whitish membranous, distended by the contorted and enclosed inner flower-parts; corolla not exerted.

TYPE SPECIMEN: Ottawa, Ontario, vegetatively propagated from a single plant found growing spontaneously in pasture on Experimental Farm on September 23, 1957, *W. G. Dore 17200*. Figure 9 shows a selection of heads in progressive stages of development from the clone. In its vegetative parts the plant resembles Ladino Clover and may be a segregate of that cultivar.

MONSTROSITIES

'Phyllody' is a term widely used for those kinds of vegetative proliferation in which green, leaflike structures develop in the flower head, replacing some or all of the flower parts. Phyllody has long been known in white clover in Europe and an interesting account of it is given in Sowerby's *English Botany* of 1864. Botanists in the past have proposed technical names for such phyllodic plants more than once and the following names apparently apply to the same thing: *Trifolium repens* f. *phyllanthum* Seringe (*in* DeCandolle, *Prodr.* II: 199, 1825); *T. repens* f. *monstrosum* Gaudin (*Fl. Helv.* 4: 575, 1829); *Trifolium umbellatum* Losc. (*in* Willk. & Lange, *Prodr. Fl. Hisp.* III: 355, 1880).

It is likely that phyllody in the clovers is due to parasitism or to some unusual condition of the environment which causes the flowers to develop in an aberrant fashion. Such plants should therefore be considered 'monstrosities', that is, true abnormalities or, in the sense that the parasite is part of the host's environment, ecological forms. Monstrous growths, according to the usual concept of classification are not awarded systematic rank, but some authors, wishing to dispose in some way of epithets already proposed, have created a special category, *monstrum* or *forma monstrosa*, to take care of them. *Trifolium repens* m. *phyllanthum* (Ser.) Asch. & Graebn. (*Syn. Mitt. Fl.* VI: 499, 1910), for example, is designed to take care of the three names cited above.

In *Trifolium* the leafy outgrowths may consist of one or three leaflets but the condition is variable within the heads on the same plant, and sometimes different floral members are involved. Several variants are discussed and illustrated by Erith (1924), who decided that the exact cause of the teratological formation remained uncertain in spite of the vast number of investigations which had been made. More recently, Frazier and Posnett (1956) have reported that phyllody in clovers (*T. repens* and *T. pratense*), quite prevalent in Britain, is caused by an insect-transmitted virus. Ghisleni & Quagliotti

(1956) describe a proliferous condition, which may be similar in nature, and claim that seeds produced in the leafy florets will grow into new plants when the heads touch the ground.

The following Canadian specimens of the monstrosity loosely called 'phyllody' have been seen in the course of this study and it may be well to list them now: in *Trifolium hybridum*: Montmagny, Que., meadow on moist land, W. G. Dore, July 12, 1941; Pouce Coupe River at its junction with the Peace River, B.C., C. H. Crickmay, 20 June-10 July, 1943 (UBC); Kentville, N.S. C. O. Gourley, July 15, 1957; Ste. Anne de la Pocatiere, Que., in an experimental plot, K. Hill & G. J. Ouellette, July 7, 1958; in *Trifolium repens* L.: Fredericton, N.B., H. Groh, July 14, 1931.

SUMMARY

Plants exhibiting proliferous inflorescences of two types are considered to be of genetic nature and are described and named as follows: a 'cauliflower' development consisting of dense clusters of chlorotic and rudimentary scales in *Medicago sativa* f. **prolifera**, *Trifolium hybridum* f. **proliferum**, *Melilotus alba* f. **prolifera** and *Hedysarum mackenzii* f. **proliferum**; an 'onion' development in which the petals and stamens are included in the distended calyx in *Trifolium hybridum* f. **allioideum** and *T. repens* f. **allioideum**. Phyllody of clover flowers is considered to be nongenetic.

REFERENCES

- ERITH, A. G. 1924. White clover (*Trifolium repens* L.): a monograph. London, Duckworth.
- FRAZIER, N. W., and A. F. POSNETT. 1956. Leafhopper transmission of a clover virus causing green petal disease in strawberry. *Nature* 177:1040-1041.
- GHISLENI, P. L. and L. QUAGLIOTTI. 1956. Note sulla morfo-fisiologia dell' infiorescenza e sulla propagazione del ladino (*Trifolium repens* L.). *Allionia* 3:75-83.
- PADDOCK, E. F., and L. J. ALEXANDER. 1952. Cauliflower, a new recessive mutation in tomato. *Ohio J. Sci.* 52:327.
- STEWART, GEO. 1934. Effects of inbreeding on variability in alfalfa. *J. agric. Res.* 49:692.
- VUILLEMIN, P. 1926. Les anomalies végétales: leur cause biologique. Paris, Presses Univ. France.

Received for publication 14 August 1958

CONTRIBUTIONS TO THE FLORA OF NOVA SCOTIA

VI. NOTES ON THE VEGETATION OF THE BIRD ISLANDS

E. CHALMERS SMITH and WILFRED B. SCHOFIELD

Perry Biological Laboratories, Acadia University, Wolfville, Nova Scotia

IN JULY 1954, the authors visited the Bird Islands, Victoria County, in the hope that they might find in these exposed carboniferous areas isolated species additional to those already known in the province, and also to study the influence of birds on the vegetation.

The islands are two in number, located off the east coast of Cape Breton Island. Hertford, the inner island, lies approximately one and a half miles east of Cape Dauphin. Ciboux, the outer island, lies half a mile east of Hertford and is connected to it by a line of jutting outcrops and sea stacks and a submerged reef. Hertford Island is about seven-eighths of a mile in length and one-sixteenth of a mile in width at the widest point. Ciboux Island is somewhat larger, being one and one-sixteenth miles in length and slightly less than one-eighth of a mile wide at its broadest point. Ciboux has a total area of thirty-five acres whereas that of Hertford is twenty-seven acres. In general appearance the islands seem rather flat-topped, sloping gently to the south. The surface is not dissected by any marked depressions. No swamps, springs, or water courses are present.

Both islands are composed of tilted carboniferous (Mississippian) sedimentary rocks, mainly coarse conglomerates and sandstones, that dip at an angle of approximately twenty degrees to the south and strike in an east-west direction. On all sides the islands possess relatively high cliffs, some reaching a height of one hundred feet. In some places these have been deeply undercut by the sea; in others continual weathering along joints has resulted in the dropping of large blocks from the main mass and the formation of large gullies, particularly on Ciboux Island. In some areas large masses of rock have fallen into the sea leaving broad shelves part way up the main cliff.

The islands have been known for a considerable time as a nesting site for sea birds. Samuel Holland (Harvey, 1935) in 1766 wrote: "The Ciboux and Hertford Islands are nothing but barren Rocks, where Sea-fowls of all Kinds have their Resorts." According to local tradition in the area, the bird life of the islands has been a source of fresh meat and eggs to fishermen since the coastal waters have been fished. At the time of the present survey, Herring Gulls and Chipping Sparrows nested among the grasses, particularly on Hertford Island. The adult birds abandoned the young and eggs at the approach of the boat, and remained hovering above the island for the duration of the visit. The young Herring Gulls either sat among the grass or congregated in large numbers along the brows of the cliffs. Rarely one ventured too far out on the cliff edge and was forced to fly to the rocks below. Those still in woolly gray plumage hid among the grasses. There were probably over three hundred young gulls on Hertford Island. Unhatched eggs were rare and were always solitary. No nests of Chipping Sparrows were seen, but the

agitation of the birds suggested that they must have had nests among the grasses.

On the cliff ledges Double Crested Cormorants had made large tangled nests mainly of *Empetrum nigrum* and *Juniperus horizontalis*, plants which were probably transported from Ciboux Island since neither were found on Hertford Island but were abundant on the former. These birds remained in or near their nests even at a very close approach. The young were found in different nests about the island in practically all stages of immaturity. Some nests contained unhatched eggs.

Puffins nested frequently in small crannies in the cliffs. These left their nests as the boat passed below them, and alighted on the water beyond it. Because of their inaccessibility no nests were examined. Black Guillemots, although frequenting the waters nearby, were not noted to have nests on the islands.

Ciboux Island had, in general, fewer birds, although since the departure of the light keeper from that island two years previous to this study, the birds had begun to return and to nest in increasing numbers.

The vegetation of both islands has been altered to a considerable extent by man. Information gathered locally indicated that both islands were originally wooded. However, in direct contradiction is the statement of Holland that in 1766 the islands were barren rocks. Since the establishment of the light on Ciboux Island, now operated by remote control, one family lived there continuously up to 1952. At least one of these light keepers, Angus Campbell, cultivated an area of approximately one acre in the vicinity of the lighthouse some 40 to 50 years ago. Fishing shelters have been occupied intermittently on Ciboux Island during the fishing season. There is no record of any habitation on Hertford Island, but large flocks of sheep have been put to summer pasture there for many years.

On Ciboux Island there are three distinct habitats: sea cliffs, rock-walled gullies, and the "field" that covers the greater portion of the island. To these might be added the bared areas near the building which were seen to be colonized mainly by weeds. On Hertford Island an area of dead and dying trees altered one part of the richer "field." The sea cliffs are similar to those of Ciboux Island; the rock-walled gullies are absent.

The "field" habitat was common to both islands but each possessed a very different association of species. On Ciboux Island the field presented a rather patchy appearance. The common grass was *Festuca rubra* (Fescue). There was also a sparse scattering of *Deschampsia flexuosa* (Common Hairgrass), *Poa pratensis* (Kentucky Bluegrass), and *Agrostis alba* (Redtop). Near the cliff tops and on the higher and more exposed parts of the field, *Juniperus communis* var. *saxatilis* (Ground Juniper), *Potentilla tridentata* (Three-toothed Cinquefoil), and *Empetrum nigrum* (Black Crowberry) often formed a continuous intermeshing tangle which allowed only occasional colonization by plants of *Euphrasia randii* (Eyebright) and *Achillea lanulosa* (Yarrow). In barer spots among these mats were rare colonies of *Vaccinium angustifolium* var. *laevifolium* (Blueberry), *Danthonia spicata* (Poverty Grass), and *Vac-*

cinium vitis-idaea var. *minus* (Foxberry). Contributing to the patchy appearance mentioned above were *Fragaria virginiana* and *Fragaria vesca* var. *americana* (Strawberries), *Rumex acetosella* (Sheep Sorrel) and *Aster novi-belgii* (Aster), which formed large pure colonies in the "field". These species, with the *Juniperus*, *Empetrum*, and *Potentilla* colonies, gave among the interfringing grassy areas, the striking mottled appearance to the field.

The "field" on Hertford Island, on the other hand, showed a definite uniform aspect. Here the dominant grass was *Poa pratensis* in rank, nearly pure stands. These were broken by scattered colonies of *Rubus idaeus* var. *strigosus* (Raspberry) and a few large clumps of *Rumex orbiculatus* (Water Dock). An area of approximately three hundred by one hundred feet was occupied by dead *Abies balsamea* (Fir) and *Prunus virginiana* (Chokecherry) trees. Here *Rubus*, *Rumex*, and *Polygonum cilinode* (Climbing Buckwheat) were luxuriant. *Poa palustris* (Fowl Meadow Grass) was also frequent in this habitat.

Away from the salt spray on the upper slopes and shelves of the cliffs of both islands *Plantago juncooides* var. *decipiens* (Seaside Plantain), *Ligusticum scoticum* (Scotch Lovage), and *Solidago sempervirens* (Seaside Goldenrod) were most characteristic, with the latter extending furthest down the cliff face. Further up on the cliffs these species were joined by *Festuca rubra*, *Achillea lanulosa*, *Elymus mollis* (Sea Lyme Grass), *Carex silicea* (Beach Sedge), and introduced weeds such as *Senecio vulgaris* (Common Groundsel), *Cirsium vulgare* (Bull Thistle), *Plantago major* (Plaintain), and *Chenopodium album* (Pigweed). These introduced species were rare. On the brow and upper shelves of the cliffs of Ciboux Island *Juniperus horizontalis* (Creeping Savin) and *Empetrum nigrum* appeared with the preceding species. Ciboux Island, moreover, differed from Hertford in that the cliff species had invaded the "field" habitat.

The rock-walled gullies of the west end of Ciboux Island provided a habitat peculiar to that island. These gullies, protected from the more severe weather experienced by the main exposed portion of the island, sheltered a number of species normally characteristic of woodlands. Species not found elsewhere on the islands included *Dryopteris filix-mas* (Male Fern), *Dryopteris phegopteris* (Beech Fern), *Dryopteris spinulosa* (Spinulose Wood Fern), *Smilacina stellata* (False Solomon's Seal), *Maianthemum canadense* (Wild Lily-of-the-Valley), *Heracleum maximum* (Cow Parsnip), and *Ribes lacustre* (Bristly Black Currant).

The only forest-tree species present on Ciboux Island was *Picea glauca* (White Spruce); three wind-blown, dwarfed specimens were found on the sheltered side of a rock mass that had fallen away from the main mass. On Hertford Island, in the "forested area," the main tree was *Abies balsamea*, all of which were dead. A number of these, about twenty inches in diameter at the butt, were estimated to be about fifty years old; few exceeded twenty-five feet in height. The limbs showed a tendency to greater growth on the side opposite that of the prevailing wind, and were found from the top to very close to the ground. Interspersed with these dead trees was a large number of living trees of *Prunus virginiana*. The growth habit of these also suggested that

they were not part of an original forest, and no herbaceous ground-cover species typical of a forest occurred in this area.

The bared areas near the dwellings on Ciboux Island supported a number of introduced species, but these were few in number and localized. *Agropyron repens* (Couch Grass) and *Carum carvi* (Caraway) colonized the previously cultivated area; near the fish house the commonest species were *Poa annua* (Annual Bluegrass), *P. trivialis* (Rough-stalked Meadow Grass), *Alopecurus pratensis* (Meadow Foxtail), *Phleum pratense* (Timothy Grass), *Juncus bufonius* (Toad Rush), *Rumex crispus* (Yellow Dock), *Polygonum aviculare* (Knotweed), *Spergularia rubra* (Sand Spurry), *Stellaria media* (Common Chickweed), *Capsella bursa-pastoris* (Shepherd's Purse), *Raphanus raphanistrum* (Cadlock), *Potentilla norvegica* (Cinquefoil), *Trifolium* spp. (Clovers), *Vicia cracca* (Tufted Vetch), *Linaria vulgaris* (Toadflax), *Plantago major* (Common Plantain), *Matricaria matricarioides* (Pineapple Weed), and *Cirsium arvense* (Canada Thistle). Some of these had spread to the "field" and to the cliff habitat.

It was only on Ciboux Island that the bird colonies appeared to have affected the vegetation. Here the nesting sites were located mainly on colonies of *Festuca rubra*, fragments of which were pulled up and piled to form shallow nests. The total effect of this and of the manuring, as well as dead fish debris, was to kill out patches of this grass. On these bared areas *Fragaria* spp. seemed to be the first plants to establish themselves. As a final result of this colonization small areas were left covered by *Rumex acetosella*, *Achillea lanulosa*, *Potentilla tridentata*, *Cerastium vulgatum*, and *Stellaria graminea*. These latter plants appeared to tolerate little competition and would very probably be destroyed later by the encroaching margins of the *Festuca rubra* colonies when the effects of the nesting sites were sufficiently neutralized. *Aster novi-belgii*, although more resistant to extreme competition, occurred in much the same fashion. The total effect was to produce the spotty appearance of the "field." No suggestion of a similar succession was present on Hertford Island where *Poa pratensis* was the dominant grass. This species, rather than suffering from the manuring, flourished and grew tall and rank.

LIST OF SPECIES OF VASCULAR PLANTS OCCURRING ON THE BIRD ISLANDS

H = Hertford Island C = Ciboux Island + = present — = absent
x = very rare

Introduced plants are indicated by capital letters

SPECIES	H	C	SPECIES	H	C
xDryopteris phegopteris (L.) Christens.	—	+	Juniperus horizontalis Moench	—	+
xDryopteris spinulosa (O.F. Mueller) Watt	—	+	Festuca rubra L.	+	+
xDryopteris filix-mas (L.) Schott	—	+	Festuca rubra L., var. juncea (Hack.) Richter	+	+
xAbies balsamea (L.) Mill.	+	—	POA ANNUA L.	+	+
xPicea glauca (Moench) Voss	+	+	Poa pratensis L.	+	+
Juniperus communis L., var. saxatilis Pallas	—	+	xPoa trivialis L.	+	+
			xPoa palustris L.	+	+
			xPoa alpina L.	—	+

SPECIES	H	C	SPECIES	H	C
xAgropyron trachycaulum (Link)			Empetrum nigrum L.	—	+
Malte, var. novae-angliae (Scribn.)			Viola cucullata Ait.	+	+
Fern.	—	+	xViola pallens (Banks) Brainerd	—	+
Agropyron repens (L.) Beauv.	—	+	xOenothera biennis L.	—	+
xElymus mollis Trin.	—	+	CARUM CARVI L.	—	+
Deschampsia flexuosa (L.) Trin.	+	+	xLigusticum scoticum L.	+	+
Danthonia spicata (L.) Beauv.	+	+	xCoelopleurum lucidum (L.) Fern.	—	+
AGROSTIS ALBA L.	+	+	xHeracleum maximum Bartr.	—	+
PHLEUM PRATENSE L.	+	+	xVaccinium angustifolium Ait.,		
xALOPECURUS PRATENSIS L.	—	+	var. laevifolium House	—	+
xANTHOXANTHUM			xVaccinium vitis-idaea L.,		
ODORATUM L.	+	—	var. minus Lodd.	+	+
xPanicum boreale Nash	—	+	xConvolvulus sepium L.,		
xCarex silicea Olney	+	+	forma colorata Lange	—	+
xCarex nigra (L.) Reichard	—	+	LINARIA VULGARIS Hill	—	+
xJuncus bufonius L.	—	+	xVERONICA SERPHYLLIFOLIA		
xJuncus tenuis Willd.	+	—	L.	+	—
xLuzula multiflora (Retz.) Lejeune	—	+	Euphrasia randii Robins.	—	+
xSmilacina stellata (L.) Desf.	—	+	Euphrasia americana Wettst.	+	+
xMaianthemum canadense Desf.	—	+	Rhinanthus crista-galli L.	—	+
Sisyrinchium montanum Greene,			Rhinanthus crista-galli L., var. fallax		
var. crebrum Fern.	—	+	Wimm. & Grab.) Druce	—	+
Rumex orbiculatus Gray	+	—	xPLANTAGO MAJOR L.	+	+
xRUMEX CRISPUS L.	—	+	Plantago juncoides Lam., var.		
RUMEX ACETOSELLA L.	+	+	decipiens (Barnéoud) Fern.	+	+
xPOLYGONUM AVICULARE L.	+	—	xSambucus pubens Michx.	+	—
xPolygonum cilinode Michx.	+	—	Campanula rotundifolia L.	+	+
xCHENOPODIUM ALBUM L.	+	+	Solidago sempervirens L.	—	+
xSpergularia rubra (L.)			Aster novi-belgii L.	+	+
J. & C. Présł	—	+	xAnaphalis margaritacea (L.)		
Sagina procumbens L.	+	+	C. B. Clarke, var. intercedens Hara	—	+
Arenaria lateriflora L.	+	+	ACHILLEA LANULOSA Nutt.	+	+
xSTELLARIA MEDIA (L.) Cyrillo	—	+	xMATRICARIA MATRI-		
STELLARIA GRAMINEA L.	+	+	CARIOIDES (Less.) Porter	—	+
CERASTIUM VULGATUM L.	+	+	xSENECIO VULGARIS L.	+	+
xRANUNCULUS REPENS L.	+	+	xSENECIO JACOBAEA L.	—	+
xRANUNCULUS ACRIS L.	—	+	xARCTIUM MINUS (Hill) Bernh.	+	—
xCAPSELLA BURSA-PASTORIS			xCIRSIIUM VULGARE (Savi)		
(L.) Medic.	+	+	Tenore	+	—
xRAPHANUS RAPHANISTRUM			CIRSIIUM ARVENSE (L.) Scop.	+	+
L.	—	+	LEONTODON AUTUMNALIS		
xCardamine parviflora L., var. areni-			L.	+	+
cola (Britt.) O. E. Schulz	+	+	xTARAXACUM OFFICINALE		
xRibes lacustre (Pers.) Poir.	—	+	Weber	+	+
Fragaria virginiana Duchesne	+	+	xSONCHUS ARVENSIS L.	—	+
Fragaria vesca L., var. americana			xHIERACIUM PILOSELLA L.	+	+
Porter	—	+	xHIERACIUM AURANTIACUM		
Potentilla tridentata Ait.	+	+	L.	—	+
xPotentilla norvegica L.	—	+	xHIERACIUM FLORIBUNDUM		
Rubus idaeus L., var. strigosus			Wimm. & Grab.	+	+
(Michx.) Maxim.	+	+			
Prunus virginiana L.	+	—			
TRIFOLIUM REPENS L.	+	+	Total	51	85
xTRIFOLIUM HYBRIDUM L.	—	+	Total number of species and		
xVICIA CRACCA L.	—	+	varieties on the islands		96

The vascular flora of the islands consists of only ninety-six species. Most of these are commonly found in similar habitats on the neighboring coastal areas of Cape Breton Island. *Poa alpina*, rare on Ciboux Island, had not previously been collected in Nova Scotia. *Cardamine parviflora* var. *arenicola*, found commonly on the nesting sites on Ciboux Island and on the cliff slopes of Hertford Island, is a rare species in the province, having been collected from Victoria County once previously (Smith, Schofield, Taylor, Webster, Slipp, 1974, top of boulder slope, Rocky Brook, July 15, 1953), and from Halifax (Roland, 1947), Cumberland, Kings and Digby Counties (Schofield, 1955), some six known stations.

Holland's report that the islands were "barren rocks" in 1766 seems to conflict with the local tradition that the islands were originally wooded. No clear evidence could be found to support the latter view, except perhaps the existence of some typical woodland plants in the rock-walled gullies of Ciboux, and the small "wood" of dead Fir and Chokecherry trees on Hertford. The only areas that could be regarded as completely undisturbed are the sea cliffs, ledges, and rock-walled gullies; even here the invasion of weedy species had occurred.

The authors wish to acknowledge the support of the Nova Scotia Research Foundation and the help of the members of the field party, D. H. Webster and P. A. Bentley. Collections of the flora have been deposited in the Acadia University Herbarium.

REFERENCES

- HARVEY, D. C. 1935. Holland's description of Cape Breton Island and other documents. Public Archives of Nova Scotia Publication No. 2.
- ROLAND, A. E. 1947. Flora of Nova Scotia. Trans. N.S. Inst. Sci. 21:96-642.
- SCHOFIELD, W. B. 1955. Contributions to the flora of Nova Scotia, V. *Rhodora* 57:301-310.

Received for publication 28 July 1958

GRASSLAND VEGETATION NEAR FORT PROVIDENCE, NORTHWEST TERRITORIES

JOHN W. THIERET

Chicago Natural History Museum, Chicago 5, Illinois

SCATTERED throughout the central part of the generally forested Mackenzie River basin are bits of grassland. The distribution of these can perhaps be best described as insular. They, in common with other grassland of the subarctic Great Plains, have been little studied. Significant contributions to the knowledge of northern Great Plains grassland have been made by Moss (1952, 1953), who described grasslands in central and northern Alberta, and by Raup (1934, 1935, and 1947), who described grasslands in Wood Buffalo Park, Alberta; on the upper Peace River, Alberta; and at Fort Simpson, Northwest Territories. Aside from these studies, such grasslands are yet to be investigated. Their origin, their flora and community structure, and their relationship to grasslands further north and south are provocative problems.

Grasslands in the vicinity of Fort Providence, District of Mackenzie, N.W.T., were noted as long ago as the 1890's by white explorers (McConnell, 1891; Russell, 1898). During the summer of 1958 I had the opportunity to investigate some of these grasslands in two areas: (1) three to four miles northeast of Fort Providence, and (2) twelve miles northeast of Fort Providence, near Mile 17 on the new road running from the Mackenzie River toward Fort Rae (see shaded areas, figure 1). All plants collected are in the herbarium of the Chicago Natural History Museum.

The grasslands studied are all well-defined openings in the otherwise forested region. They range in size from patches about 30 feet across to more extensive areas about $\frac{1}{2}$ by $\frac{3}{4}$ mile. They are surrounded mainly by shrubby willows (*Salix* spp.) up to 10 or 15 feet tall, but trembling aspen (*Populus tremuloides*) and dwarf birch (*Betula glandulosa*) are also frequent to common in the border zones. These shrubs and trees occur also as scattered individuals in many of the grasslands, especially at the periphery. In such cases, the marginal woody vegetation appears to be encroaching slowly upon the grasslands.

In the grasslands on marshy or swampy sites, a high water table has presumably been effective in preventing invasion by trees. The factors responsible for the existence of grasslands on better drained areas, however, are obscure. Perhaps the best hypothesis to account for them is that they "developed as such directly upon the new soils exposed at the drainage of the postglacial lakes, or that they followed some sort of tundra which in turn originated on these soils" (Raup, 1941). Little evidence was noted that these grasslands are not 'natural.' It is known that repeated burning can sometimes cause grassy openings in a forested region (Raup, 1947); however, signs of fire — occasional charred, small logs covered by thick *Calamagrostis* turf — were seen in only one of the areas studied.



FIGURE 1. Map of the Fort Providence region, N.W.T. Line-shaded areas indicate location of studied grasslands.

The grasslands occur on clayey soils that were laid down presumably when water stood at the 800-foot level in the Great Slave Lake basin (Cameron, 1922). Soil sections examined showed in most cases two to three inches of humus underlaid by gray clay down to at least two feet. A slight amount of sand was noted in the upper two inches of the clay at several sites.

Up to seven years ago hay was cut from the marshes and prairies closest to Fort Providence. The wagon roads leading into the grasslands are still in evidence.

The Fort Providence grasslands intergrade both floristically and in habitat. However, certain stages are well marked and worthy of recognition as communities. The habitat factor that appears to play a deciding role in the distribution of the communities is water. The wettest areas are occupied by a

Scolochloa-Carex community. The driest are dominated by *Agropyron* and *Muhlenbergia*. Between these extremes, on comparatively mesic sites, occurs the *Calamagrostis-Agropyron-Carex* community.

To indicate subjective estimates of the frequency of the secondary species, that is, those species, other than the dominants, present in the communities, I use the following symbols in the species lists below: *la*, locally abundant; *c*, common; *lc*, locally common; *f*, frequent; *s*, scattered; and *r*, rare. The species marked [1] range north of the boreal limit of trees; those marked [2] extend northward only to or near the tree line; and those marked [3] are known to extend only as far north as the Great Slave Lake region.

I. *Scolochloa festucacea-Carex aquatilis-Carex atherodes* community

dominant species: *Scolochloa festucacea* [3]

Carex aquatilis [1]

Carex atherodes [2]

secondary species: *Alopecurus aequalis* (*r*) [2]

Calamagrostis inexpansa var. *brevior* (*lc*) [1]

Glyceria pulchella (*la*) [2]

Rumex fueginus (*r*) [2]

Rumex occidentalis (*s*) [2]

Polygonum amphibium var. *stipulaceum* (*s*) [2]

Ranunculus gmelinii var. *hookeri* (*r*) [2]

Rorippa islandica var. *fernaldiana* (*r*) [2]

Potentilla palustris (*s*) [1]

Epilobium palustre var. *obliganthum* (*r*) [2]

Sium suave (*s*) [2]

Mentha arvensis var. *villosa* (*s*) [2]

Scutellaria galericulata var. *epilobiifolia* (*r*) [2]

Galium trifidum (*lc*) [2]

This community occurs in areas that might best be designated as marshes. When I investigated them — in the second week in August — several inches of surface water was present. However, several residents of Fort Providence assured me that often — either earlier or later in the year — little or no surface water remains. The dominant grass and sedges, all turf-formers, may be intermingled or each may form pure stands. *Rumex occidentalis* and *Sium suave* are the most apparent secondary species. Others are few, not only in number of species but also in number of individuals. Mosses are rare in this community, only several small clumps being noted. Infrequent in the marshes are peaty hummocks that are about 20 inches high. On these hummocks occur none of the plants typical of the marsh community. Instead, the hummocks are dominated by *Calamagrostis neglecta*. Other species on them include *Geum macrophyllum* var. *perincisum*, *Cicuta maculata*, *Mentha arvensis* var. *villosa*, and *Petasites sagittatus*. These hummock plants obviously pertain to the wet phase of the *Calamagrostis-Agropyron-Carex* community described below.

II. *Calamagrostis neglecta*-*Agropyron trachycaulum*-*Carex atherodes* community

(species marked * are found only in the wet phase)

- dominant species: *Calamagrostis neglecta* [1]
Agropyron trachycaulum var. *glaucum* [3]
Agropyron trachycaulum var. *novae-angliae* [3]
Carex atherodes [2]
- secondary species: *Agrostis scabra* (s or la) [2]
 **Beckmannia syzigachne* (s) [2]
Calamagrostis inexpansa var. *brevior* (s) [2]
Hierochloa odorata (r) [1]
Hordeum jubatum (s or la) [1]
Poa pratensis (r) [1]
 **Scolochloa festuacea* (lc) [3]
 **Carex aurea* (la) [2]
 **Polygonum amphibium* var. *stipulaceum* (s) [2]
Polygonum ramosissimum (r) [3]
 **Rumex occidentalis* (s) [2]
Stellaria longipes (f) [1]
Fragaria virginiana var. *terrae-novae* (lc) [2]
 **Geum macrophyllum* var. *perincisum* (s) [2]
Potentilla arguta (r) [2]
Potentilla pennsylvanica (r) [2]
Rosa acicularis (r) [2]
Rubus arcticus (lc) [2]
Astragalus goniatus (r) [3]
Vicia americana (f) [3]
Shepherdia canadensis (r) [2]
Epilobium angustifolium (f) [1]
 **Epilobium glandulosum* var. *adenocaulon* (f) [2]
 **Cicuta maculata* (s) [2]
 **Sium suave* (s) [2]
Arctostaphylos uva-ursi (r) [2]
Primula incana (s) [2]
Gentiana amarella (s or la) [2]
Lomatogonium rotatum (s or la) [1]
 **Mentha arvensis* var. *villosa* (f) [2]
Stachys palustris var. *nipigonensis* (s) [2]
Castilleja raupii (s) [2]
Rhinanthus crista-galli (s or la) [3]
Galium septentrionale (r) [2]
Symphoricarpos occidentalis (r) [3]
Achillea lanulosa (r) [2]
Antennaria parvifolia (lc) [2]
Aster ciliolatus (r) [2]
Aster junciformis (f) [2]
Aster pansus (f) [2]

Erigeron lonchophyllus (f) [2]
Hieracium umbellatum (s) [2]
**Petasites sagittatus* (lc) [1]
Senecio pauperculus (f) [2]
Solidago lepida var. *elongata* (r) [3]

The *Calamagrostis-Agropyron-Carex* community is the principal one on the Fort Providence grasslands. Dominant over most of it are the turf-formers *Calamagrostis neglecta* and *Carex atherodes* (see figure 2). In the driest sites occupied by the community occur two varieties of *Agropyron trachycaulum*, a bunch grass, either intermingled with *Carex* and *Calamagrostis* or replacing the *Calamagrostis* almost entirely. The dominant plant on the infrequent anthills and hummocks in areas occupied by this community is often *Agropyron*. The wet phase of the *Calamagrostis-Agropyron-Carex* community is dominated by *Calamagrostis* and *Carex*. The secondary species of the wet phase are those marked with an asterisk in the above list. Some of the Fort Providence grasslands, dominated by often dense stands of *Calamagrostis neglecta* with its brown inflorescences, have the appearance of fields of grain. Certain plants, which are infrequent and scattered in undisturbed areas, become locally abundant in wagon roads that pass through grasslands dominated by *Calamagrostis* and *Carex*. These plants are *Agrostis scabra*, *Hordeum jubatum*, *Gentiana amarella*, *Lomatogonium rotatum*, and *Rhinanthus crista-galli*. *Beckmannia syzigachne* was found only in the wettest parts of the wagon roads and in a disturbed depression that possibly is a wallow.

III. *Agropyron trachycaulum-Muhlenbergia richardsonis* community

dominant species: *Agropyron trachycaulum* var. *glaucum* [3]
Agropyron trachycaulum var. *novae-angliae* [3]
Muhlenbergia richardsonis [2]



FIGURE 2. *Calamagrostis-Carex* dominated grassland, three miles northeast of Fort Providence, N.W.T. August 1958.

- secondary species: *Calamagrostis inexpansa* var. *brevor* (r) [1]
Hordeum jubatum (f) [1]
Carex praticola (f) [2]
Smilacina stellata (r) [2]
Sisyrinchium montanum (r) [2]
Stellaria longipes (f) [1]
Anemone multifida (r) [2]
Thalictrum venulosum (c) [2]
Ribes oxycanthoides (r) [2]
Fragaria virginiana var. *terrae-novae* (lc) [2]
Potentilla pennsylvanica (f) [2]
Rosa acicularis (f) [2]
Astragalus goniatus (f) [3]
Vicia americana (f) [3]
Shepherdia canadensis (r) [2]
Arctostaphylos uva-ursi (r) [2]
Gentiana amarella (f) [2]
Lomatogonium rotatum (f) [1]
Castilleja rauhii (f) [2]
Galium septentrionale (c or la) [2]
Achillea lanulosa (f) [2]
Antennaria subviscosa (f) [3]
Aster junciformis (f) [2]
Aster pansus (f) [2]
Senecio pauperculus (f) [2]
Solidago lepida var. *elongata* (r) [3]

The *Agropyron-Muhlenbergia* community was found on only one of the insular grasslands, an opening about one acre in extent. The dominant grasses are bunch-formers. The community contains a number of 'typical' prairie plants — for example, *Smilacina*, *Sisyrinchium*, *Anemone*, *Thalictrum*, and *Ribes* — that I found nowhere else in the Fort Providence grasslands. The most common forbs in the community are *Galium septentrionale* and *Thalictrum venulosum*. The former species becomes the dominant and almost the only plant on the several anthills in the prairie.

A total of 67 species was collected in the Fort Providence grasslands. Of these, the species of most restricted known distribution is *Antennaria subviscosa*, known only from a few stations in Yukon, District of Mackenzie, Saskatchewan, and Gaspé. Nearly all the other species are widespread in North America. Many range across the continent from Alaska to the Gulf of St. Lawrence, and also far south, most of them extending well into the United States. The species represented in the Fort Providence grasslands may be divided into three groups, based upon the northward extent of the known ranges as given in Scoggan's *Flora of Manitoba* (Scoggan, 1957): (1) those whose ranges extend north of the boreal limit of trees — about 16 percent of the species, marked [1] in the species lists; (2) those whose northern limits are at or near the tree line — about 69 percent of the species, marked [2] in the species list; and (3) those whose ranges are not known to extend north of the Great Slave Lake region —

about 15 percent of the species, marked [3] in the species lists. Certain species of the third group may eventually be found to range north to the tree line. From these data it is obvious that the flora of the Fort Providence grasslands has decided subarctic and temperate affinities.

About 92 percent of the Fort Providence grassland plants are herbaceous and 8 percent — *Ribes oxycanthoides*, *Rosa acicularis*, *Shepherdia canadensis*, *Arctostaphylos uva-ursi*, and *Symphoricarpos occidentalis* — are shrubs. Of the herbaceous plants, about 86 percent are perennials and 14 percent — *Beckmannia syzigachne*, *Polygonum ramosissimum*, *Rumex fueginus*, *Rorippa islandica fernaldiana*, *Cicuta maculata*, *Gentiana amarella*, *Lomatogonium rotatum*, *Rhinanthus crista-galli*, and *Erigeron lonchophyllus* — are annuals or biennials.

Communities similar to those in the Fort Providence grasslands are known to occur in adjacent areas of the District of Mackenzie and Alberta. The *Scolochloa-Carex* marsh community is similar to the "reed swamp" community described by Moss (1953) for northwestern Alberta and to the marshy shore association described by Raup (1935) for lake margins in Wood Buffalo Park. Certain insular grasslands in the Fort Simpson area, 130 miles down the Mackenzie River from Fort Providence, are dominated by *Calamagrostis neglecta* (Raup, 1947). It is to these grasslands that the *Calamagrostis-Agropyron-Carex* community near Fort Providence is apparently quite similar. *Calamagrostis* grasslands occur also in Wood Buffalo Park (Raup, 1935) and in northwestern Alberta (Moss, 1953), but there the species found are *C. canadensis* and *C. inexpansa*. The *Agropyron-Muhlenbergia* community at Fort Providence is floristically similar in part to the "saline meadow" described by Moss (1953) for northwestern Alberta and to prairies on the Salt Plains in Wood Buffalo Park described by Raup (1935).

ACKNOWLEDGMENTS

My thanks are due to my field companion, Chester E. Hansen, teacher of biology, York Community High School, Elmhurst, Illinois, who gave able assistance in the investigation of the grasslands, and to Mr. and Mrs. William Watt, who did so much to make our stay at Fort Providence enjoyable.

REFERENCES

- CAMERON, A. E. 1922. Post-glacial lakes in the Mackenzie River Basin, North West Territories, Canada. *J. Geol.* 30:337-353.
- McCONNELL, R. G. 1891. Report on an exploration in the Yukon and Mackenzie Basins, N.W.T. *Geol. nat. Hist. Surv. Canada, Annu. Rep.* 4 (D).
- MOSS, E. H. 1952. Grassland of the Peace River region, western Canada. *Can. J. Bot.* 30:98-124.
- MOSS, E. H. 1953. Marsh and bog vegetation in northwestern Alberta. *Can. J. Bot.* 31:448-470.
- RAUP, H. M. 1934. Phytogeographic studies in the Peace and upper Liard River regions, Canada. *Contr. Arnold Arbor.* 6.
- RAUP, H. M. 1935. Botanical investigations in Wood Buffalo Park. *Bull. nat. Mus. Canada* 74.
- RAUP, H. M. 1941. Botanical problems in boreal America. II. *Bot. Rev.* 7: 209-248.
- RAUP, H. M. 1947. The botany of southwestern Mackenzie. *Sargentina* 6.
- RUSSELL, F. 1898. Explorations in the far north. Iowa City, Iowa.
- SCOGGAN, H. J. 1957. Flora of Manitoba. *Bull. nat. Mus. Canada* 140.

ADDITIONAL PLANT RECORDS FROM SPENCE BAY, BOOTHIA ISTHMUS*

D. B. O. SAVILE

Botany and Plant Pathology Laboratory, Ottawa, Ontario

IN 1951 Mr. J. G. Chillcott made a collection of plants from Spence Bay, which was reported upon by W. J. Cody (Can. Field Nat. 67:40-43. 1953). On my way south from field work on Somerset Island in 1958 I stayed at Spence Bay from August 15 to 22, primarily to search for parasitic fungi and to compare the area floristically with Somerset Island. During this period some additions were made to Mr. Chillcott's list, and these are recorded in this paper.

A detailed map at the Hudson's Bay Company's post shows the Franklin-Keewatin boundary to pass between the company's warehouse and the manager's residence. Most of the specimens taken may thus be regarded as from the junction of these two districts. The sandspit referred to below is the prolongation of an esker that runs about a mile out to sea and is flanked by sand beaches. The base of the spit is about 2 miles northwest of the H.B.C. post. This is the spit referred to by Mr. Chillcott as 4 miles northwest of the settlement. The end of the spit is roughly 4 miles from the R.C.M.P. barracks, where Mr. Chillcott lived.

It is a pleasure to acknowledge the hospitality and helpfulness of Mr. and Mrs. Eric Mitchell of the Hudson's Bay Company during my stay. I am indebted to Dr. W. G. Dore for assistance in identification of the grasses, and to Mr. J. A. Calder for assistance with some other groups.

Cystopteris fragilis (L.) Bernh. Rare in clefts of granite cliffs, 3882, 3890A.

Elymus mollis Trin. ssp. *villosissimus* (Scribn.) Löve Occasional near crest of sandspit northwest of settlement, 3866.

Festuca brachyphylla Schultes Common on rock ledges and dry ground, 3846. Random checks suggested that this species and the quite similar *F. baffinensis*, previously recorded, are about equally common in the area.

Poa glauca M. Vahl Occasional on crest of sandspit and on adjacent beaches, northwest of settlement, stature varying greatly with site, 3862, 3863, 3865.

Puccinellia bruggemannii Th. Sør. Locally abundant on brackish muddy beach near settlement, 3874.

Trisetum spicatum (L.) Richt. Scarce, on southwest gravel slope above sea beach near H.B.C. post, 3861.

Carex maritima Gunn. Moderately common in sand behind beach ridge near sandspit northwest of settlement, 3869.

Carex nardina Fr. Occasional on sand beach, northwest of H.B.C. post, 3872.

Carex rupestris All. Moderately common in moss on granite outcrops, but fruiting sparsely apparently because of unusually dry weather, 3841, 3884.

Carex scirpoidea Michx. Common on dry tundra, 3836.

Carex subspathacea Wormskj. Locally abundant on brackish muddy beach flat, 3876.

Carex ursina Dewey. Occasional on brackish muddy beach flat, 3875.

Lychnis triflora R. Br. ex Somm., Mag. Naturvid. 2:152. 1824 (*L. affinis* J. Vahl ex Fries, Mantissa 3:36. 1842). Occasional on cliff ledges and slightly moist slopes, not in marshy habitat of *L. apetalata*, 3826, 3888, 3902.

*Contribution No. 1737 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture, Ottawa, Ontario.

Stellaria crassifolia Ehrh. Seepage area near R.C.M.P. barracks, probably nitrified, flowers very scarce, 3887. A second, completely sterile colony was seen under the overhang of a boulder. This is substantially the most northern specimen known to me from the central arctic, although it is approached by one in the east and slightly exceeded by a few in the west.

Braya purpurascens (R. Br.) Bunge Scarce on a moist gravel slope near H.B.C. post, 3829; occasional on springy area above beach 2 miles northwest, 3870.

Draba lactea Adams Common on moist rocky slope near H.B.C. post, 3825.

Saxifraga foliolosa R. Br. Few small plants seen in mossy pocket in granite near shore, close to H.B.C. post, 3871.

Saxifraga rivularis L. Few plants on ledge of cliff facing northwest, 3886.

Arctostaphylos rubra (Rehd. & Wils.) Fern. Occasional on moist, well-vegetated slopes, often south-facing; on slightly drier sites than *Salix richardsonii*; fruiting sparsely; 3906. This is an appreciable northward range extension for this species in the eastern and central arctic, although it occurs slightly further north in the western arctic. Its development at Spence Bay is vigorous enough to suggest that it may be found considerably further north in the granitic parts of Boothia Peninsula.

Vaccinium uliginosum L. A single, prostrate colony, 6 ft in diameter, was found on the richly vegetated talus of an east-facing cliff, 3894. This was one of the most favorable exposures for plant growth in the district. The depauperate growth and meager fruiting in this stand suggested that this species was here at its northern limit, although it occurs slightly further north in the western arctic and much further north in the eastern arctic.

Antennaria ekmaniana Porsild Occasional in the same habitat as *Vaccinium uliginosum*, but not seen elsewhere, 3896. Probably here near its northern limit, but goes far north in the eastern arctic.

Received for publication 22 October 1958



ADVENTIVE PLANTS AT CHURCHILL, MANITOBA

EVA BECKETT

327 South Marks Street, Fort William, Ontario

ADVENTIVE plants, most of them of the weedy type, have been slowly invading the townsite and harbor areas of Churchill, Manitoba, ever since 1927, when construction operations on this railway terminal and seaport at Hudson Bay first got under way. Some species, such as wormseed mustard (*Erysimum cheiranthoides*), arrived even earlier.

The majority of these plants spring from seeds carried in rail shipments of wheat from prairie farms to the terminal grain elevator at this northern port. Here, during the process of cleaning the wheat for overseas shipment and in the later disposal of screenings, many seeds fall to railway embankments, roadsides, dockyards and other areas of disturbed soil where they readily take root.

Some of these aliens flourish for one season only, then disappear until such time as seed of their species is again introduced. It may be that they are annuals unable to produce mature seed in the few weeks of northern summer. Or, they may not be hardy enough to persist in the rigorous climate of this bleak, windswept region just at the arctic tree line on the west coast of Hudson Bay in north latitude 58° 46'.

But there are others, shepherd's purse (*Capsella bursa-pastoris*) and stink-weed (*Thlaspi arvense*) among the number, that are now well established and comparatively widespread through the settled areas. Others again, such as toadflax (*Linaria vulgaris*) and blue lettuce (*Lactuca pulchella*), have thrived for several years in certain sheltered places but have made little progress in spreading beyond.

While weed seeds in wheat shipments from the prairie may account for the introduction of most adventive species at Churchill, not all have originated through that source. An occasional species that is more characteristic of the boreal forest finds its way to this region too. One example is a station of lungwort (*Mertensia paniculata*) on a railway bank near the harbor. This clearly is an introduced plant. Where it came from, or how it came, can be only a matter of conjecture, though there is the possibility that seeds were brought by rail from Gillam, about 165 miles south of Churchill, where *Mertensia paniculata* is native and grows within close range of the railway yards.

The species adventive at Churchill are of two origins: native North American species abundant in the more southerly portions of Canada, and old-world species that followed settlement westward into the Prairies about half a century ago. Ships of many countries dock in Churchill harbor each summer and one might expect new plants from beyond the seas to arrive on them every year. Yet, of all the adventives that have come to the region since the port opened in 1931, there is not a single species than one can point to and state with assurance that it arrived directly from Europe by ship. No doubt, the observance of harbor regulations, that requires a vigilant examination of wrappings on incoming cargo and the dumping of all ship's sweepings well out at sea, has so far controlled the introduction of alien plants by this route.

With the introduction of so many new species, one might almost expect to find adventive plants dominating the flora of Churchill. This, however, is the case only in the immediate vicinity of the grain elevator and docks and in disturbed areas of the Churchill townsite and of nearby Fort Churchill. Beyond these, the range of most adventives is still comparatively limited, perhaps because the permafrost comes closer to the surface.

It is noticeable that on some sites, disturbed 25 to 30 years ago and since untouched, where adventives once established themselves, native species are definitely taking over again and leaving little room for weedy aliens. On older sites of settlement too, such as Fort Prince of Wales and the old Hudson's Bay Company trading post, both on the opposite side of the Churchill River and at some distance from the present town of Churchill, there appears to be no longer any trace of plants introduced during European occupation of these sites in the eighteenth and nineteenth centuries. Native species have completely closed in on the disturbed sites and the area remains as before, except for the rocky ruins left by man.

Following is a list of adventive plants collected by the writer at Churchill, Manitoba, during twelve years of residence there, from 1946 to 1958. Specimens to substantiate the records may be found in the herbarium of the Division of Botany, Science Service, Department of Agriculture, Ottawa, Ontario.

ADVENTIVE PLANTS OF CHURCHILL, MANITOBA

Bromus inermis Leyss. Probably introduced in wheat; persisting in waste places near the grain elevator and railway. Collected in 1946.

Poa pratensis L. Fairly widespread in the settlement; some of this species may be native, but much of it is clearly introduced and now well established near the grain elevator and railway. Collected in 1951.

Agropyron repens (L.) Beauv. Collected near the grain elevator in 1950; persisting and spreading.

Agropyron trachycaulum (Link) Malte Collected from a bank near the grain elevator. A small amount persisting.

Lolium persicum Boiss. & Hoh. A few specimens collected near the grain elevator in 1956; no further record.

Hordeum jubatum L. Introduced before the building of the railway; now widespread and abundant; collected in 1946.

Triticum aestivum L. Plants spring up annually from fallen seed near the grain elevator, but do not reach maturity in the short northern summer.

Avena fatua L. Collected infrequently near the grain elevator, apparently only temporary.

Agrostis stolonifera var. *compacta* Hartm. Occurring near the railway and grain elevator; persisting but not abundant.

Agrostis scabra Willd. Collected in 1953, in disturbed peaty soil near the railway; persisting but not common.

Phleum pratense L. A small amount persists near the grain elevator and on the site of an old stable, but not common. Collected in 1952.

Setaria viridis (L.) Beauv. A temporary species that appears from time to time near the grain elevator.

Rumex mexicanus Meisn. Collected in 1949; now well established on banks of a pond beside the grain elevator; spreading.

Polygonum aviculare L. Now a common roadside plant, persisting and spreading. Collected in 1946.

Polygonum lapathifolium L. A temporary species, found infrequently in the vicinity of the grain elevator. Collected in 1956.

Polygonum convolvulus L. Fairly common in waste places of the settlement; persisting and spreading. Collected in 1951.

Chenopodium leptophyllum Nutt. Not common; usually temporary, but one station

of this species has persisted for several years in a sheltered site near the CNR roundhouse. Collected in 1948.

Chenopodium album L. A common plant of waste places near the grain elevator; sometimes persisting in sheltered places, but most of it introduced annually. Collected in 1946.

Chenopodium gigantospermum Aellen Found infrequently in the vicinity of the grain elevator. Apparently temporary.

Chenopodium glaucum L. Now a common roadside plant. There are, no doubt, frequent introductions but some of the patches appear to persist and spread. Collected in 1946.

Chenopodium capitatum (L.) Asch. Not abundant, but persisting and spreading. Collected in 1946.

Axyris amaranthoides L. Infrequently found near the grain elevator; collected in 1953; temporary.

Monolepis nuttalliana (R. & S.) Greene Persisting and spreading, this species is found in waste places near the grain elevator. Collected in 1954.

Salsola kali L. var. *tenuifolia* Tausch A few specimens collected on railway bank near the grain elevator in 1954. Noted each year since but apparently still a temporary plant introduced annually.

Amaranthus retroflexus L. A temporary species, found occasionally in waste places near the grain elevator. Collected in 1953.

Stellaria media (L.) Cyrillo Introduced before the building of the railway, this species is now common and widespread in disturbed sites.

Lychnis alba Mill. Not at all common but some stations of this species appear to be persisting; collected in 1953.

Silene noctiflora L. Specimen collected near the grain elevator in 1946; noted occasionally since. Temporary.

Saponaria vaccaria L. Collected in 1949. A few plants appear each year in the vicinity of the elevator. Temporary.

Anemone canadensis L. A temporary species, collected in the vicinity of the grain elevator.

Thlaspi arvense L. An early introduction, this species persists and is now widespread in the settlement. Collected in 1948.

Lepidium densiflorum Schrad. Collected in the vicinity of the grain elevator, this appears to be a temporary species repeatedly introduced. Not abundant.

Lepidium ramosissimum Nels. This species appears to persist in the vicinity of the grain elevator, but may be introduced annually. Collected in 1946.

Capsella bursa-pastoris (L.) Medic. Persisting as a roadside plant and spreading widely through the settlement. Collected in 1946.

Brassica kaber (DC) L. C. Wheeler var. *pinnatifida* (Stokes) L. C. Wheeler Probably introduced in the earliest grain shipments, this species persists and is spreading.

Brassica juncea (L.) Coss. A temporary species; collected in 1946; noted occasionally since.

Brassica campestris L. Collected near the elevator in 1955. Temporary.

Erucastrum gallicum (Willd.) O. E. Schulz Probably persisting as it is now a fairly common roadside plant. Collected in 1954.

Conringia orientalis (L.) Dumort Collected near the grain elevator in 1946; noted from time to time since. Temporary.

Sisymbrium altissimum L. Found in waste places in the vicinity of the elevator. It may be persisting, though most of it may be introduced annually. Collected in 1946.

Sisymbrium loeselii L. An early introduction, this species persists and has spread to many waste spaces of the settlement. Collected in 1946.

Descurainia sophioides (Fisch.) O. A. Schulz Some of this species persists in waste places near the elevator. Collected in 1946.

Descurainia sophia (L.) Webb A fairly common plant in waste places near the grain elevator. Appears to persist. Collected in 1946.

Erysimum cheiranthoides L. Introduced many years before the building of the railway, this species is widespread, though never abundant.

Barbarea vulgaris R. Br. Occurring infrequently in the vicinity of the elevator and town. Collected in 1949.

Barbarea orthoceras Ledeb. Now well established in disturbed sites of the settlement. Collected in 1946.

Potentilla norvegica L. Not plentiful, but persisting in some sheltered places near the elevator. Collected in 1948.

Rubus idaeus L. var. *aculeatissimus* Regel & Tiling Found chiefly along the railway. One station of this species that became established in a sheltered place beside the CNR

roundhouse shortly after the building of the railway has persisted there for more than 20 years. The canes are seldom more than 12 to 18 inches high, yet they yield good fruit.

Rosa acicularis Lindl. This species, which grows abundantly on the banks of the Deer River 36 miles south of Churchill, has slowly followed gravel banks of the railway almost to the end of steel. Collected 1954.

Thermopsis rhombifolia (Nutt.) Richards. A sturdy growth of this species on a gravel bank near the elevator, collected in 1948, persisted until 1956 when it was destroyed during building construction. The only site noted.

Trifolium repens L. Persisting in a few sites. Not common. Collected in 1946.

Trifolium hybridum L. Persisting in a few sites near the elevator.

Melilotus officinalis (L.) Lam. A recent introduction, this species is persisting and spreading. Collected in 1954.

Melilotus alba Desr. A roadside plant, persisting and spreading; collected in 1952.

Vicia americana Muhl. Still a temporary plant. It sometimes persists for 2 to 3 years in one site then disappears completely. Collected in 1948.

Vicia americana var. *angustifolia* Nels. The one station of this species found, on Cape Merry ridge opposite the grain elevator, is persisting but spreading very little. Collected in 1954.

Lathyrus palustris L. var. *pilosus* (Cham.) Ledeb. Collected in 1955 from a site where sour screenings from the grain elevator had been dumped on the beach.

Heracleum maximum Bartr. When collected in 1954, this species was already well established in gravel of the railway bank, about 10 miles south of Churchill.

Collomia linearis Nutt. Occasional roadside plant. Collected near the elevator in 1955. Temporary.

Mertensia paniculata (Ait.) G. Don Growing in gravel of a sheltered bank about 200 yards south of the grain elevator. Collected in 1952. Persisting.

Lappula echinata Gilib. Now a common roadside plant of the settlement. Collected in 1948.

Dracocephalum parviflorum Nutt. Found occasionally in waste places near the elevator. Collected in 1949. A temporary species.

Solanum triflorum Nutt. Occurring infrequently in waste places near the elevator. Collected in 1954. Temporary.

Linaria vulgaris Mill. Growing in a sheltered site below the railway bank, this species is persisting vigorously, but has not yet spread beyond that site. Collected in 1946.

Plantago major L. Fairly common on roadsides through the settlement. Persisting and spreading. Collected in 1946.

Galium septentrionale R. & S. Collected in 1952, this species is persisting and spreading.

Iva xanthifolia Nutt. A few plants collected near the grain elevator in 1957.

Helianthus annuus L. f. *lenticularis* (Douglas) B. Boivin. A temporary species occurring infrequently on roadsides near the grain elevator. Collected in 1954.

Matricaria matricarioides (Less.) Porter. Collected near Anderson's general store in 1946. This species is persisting and spreading to many sites.

Artemisia biennis Willd. Common in waste places near the grain elevator. Collected in 1953; persisting and spreading.

Artemisia herriotii Rydb. Collected in 1955, when a station of more than a dozen plants of this species occurred close to an

Indian camp on the bank of the Churchill River, approximately a quarter of a mile downstream from the elevator. There has been no recurrence of this species.

Artemisia ludoviciana Nutt. var. *gnaphalodes* (Nutt.) T. & G. A temporary species that appears near the elevator and railway from time to time but does not persist. Collected in 1946.

Cirsium arvense (L.) Scop. Of infrequent occurrence; most of it temporary. Collected in 1954.

Taraxacum officinale Weber. Probably introduced in early years of grain shipping, this species is now seen commonly in waste places near the elevator and railway tracks. Persisting and spreading.

Sonchus arvensis L. var. *glabrescens* Guenth., Grab. & Wimm. Persisting on banks close to the elevator, but not common. Collected in 1954.

Lactuca pulchella (Pursh) DC. Growing in a sheltered hollow near the elevator, this species is persisting and spreading. Collected in 1955.

Received for publication 27 November 1958

NOTES

A Summer Record of the Great Gray Owl in Southern British Columbia

ON NOVEMBER 10, 1946, I examined the remains of a Great Gray Owl, *Strix nebulosa* Forster, which had been shot and hung on a fence "some time in August" of that year, by Mr. C. S. Clauda on his farm at Hullcar, British Columbia. This locality is fourteen miles due north of Vernon. Mr. Clauda was quite certain of the approximate date, as the owl had been killed on a wooded portion of the farm near a spring-fed water trough which was checked frequently during the hot weather. The dried out condition of the carcass substantiated his statement that the bird had been killed during the summer.

Mr. Clauda had seen two other large

owls fly away through the trees when he fired, and on several subsequent visits to the spring, but was of the opinion that they might have been Great Horned Owls, *Bubo virginianus* (Gmelin). As the latter species is intolerant of other owls, this seems unlikely. The evidence suggests that all three birds were members of a family group of Great Gray Owls which had been reared in the vicinity. The locality is on the edge of an extensive wooded plateau which could have provided a favorable habitat.

Excluding the debatable possibility of the dead bird's having been reared, or having bred in the vicinity, this remains as the only summer record for the Great Gray Owl in southern British Columbia.

JAMES GRANT

R.R. 2, Vernon, British Columbia
13 February 1959

Hummingbirds Attacked by Wasps

ON JULY 12, 1939, I was watching a Rufous Hummingbird, *Selasphorus rufus* (Gmelin), as it flew among the flowers in a garden at Trinity Valley, British Columbia, when it suddenly uttered a sharp squeak and dropped from sight into the foliage. Approaching the spot where the bird had disappeared, I found it lying belly down on the ground with its eyes closed and wings half spread. Just as I bent to pick it up the head of a black hornet, *Vespula maculata* (L.), with its mandibles working furiously, appeared between the bird's rectrices. The insect fled at almost the same moment it came into view and then the hummingbird took wing and disappeared over the tree tops in an almost vertical flight.

I have often wondered if the hornet actually stung the bird, in which case the result would surely have been fatal; or if the insect's sudden onslaught had caused the bird to become paralyzed with fright. As we knew of no hornet's nest in the vicinity, the attack was apparently an act of aggression rather than one of defence.

An instance of yellow-jackets, *Vespula* probably *arenaria* (Fab.), preying upon hummingbirds was observed in the same locality. We had found the nest of a Rufous Hummingbird; one day soon after the young birds hatched we were dismayed to find them being consumed by wasps. It was a summer memorable for its plague of wasps and it was perhaps not surprising that this nest failed to escape the hordes of persistent foragers.

JAMES GRANT

R.R. 2, Vernon, British Columbia
13 February 1959

Wing-clapping Display of the Long-eared Owl

ALTHOUGH, according to James Fisher (*Bird Recognition, Part 2*. Penguin Books, 1951), both sexes of the Long-

eared Owl, *Asio otus* (L.), in Great Britain are known to clap their wings during the courtship performance, this behavior, apparently, has not been recorded in North America. The following account indicates that our representative of the species also displays in this manner.

In June 1946, I often heard the low, mellow hooting of an owl on a wooded hillside near Lavington, British Columbia. It rarely began before complete darkness had fallen; it persisted, with intervals of silence, until after midnight. As I was not familiar with the voice of the Long-eared Owl, I set out one evening with a powerful flashlight, to try to establish the bird's identity; the night was "mothy and warm," and completely darkened by a low overcast. By 11 p.m. I had reached the tall Douglas fir from which the hooting emanated, but the musician was near the top, concealed by the foliage. After trying to shine the light on the bird from various positions, I withdrew and sat down in an opening on the hillside, about 25 yards from the base of the tree. In a few moments the hooting was resumed and it continued at regular intervals for about 20 minutes, except for a short pause when a Saw-whet Owl called nearby. A few moments after the hooting ceased for the last time, I was startled by a distinct yet somewhat muffled snap almost overhead in the open sky, then another, a second or two later and farther down the hillside, followed by a third some distance away. The sound was similar to that produced by shaking a heavy towel with a snapping motion.

Although the bird was not definitely identified at the time, a daylight search of the area yielded a feather of a Long-eared Owl and pellets under several trees in the vicinity. This evidence has since been corroborated by an increased familiarity with the voice of this species.

It is surprising that this display has not been recorded previously in North America. Could it be that our lack of information is due to the habits, not of our

owls, but of our observers? Bird watchers in Great Britain are perhaps less strictly diurnal than their North American counterparts.

JAMES GRANT

R.R. 2, Vernon, British Columbia
13 February 1959

Notes on the Great Auk in Nova Scotia

ALTHOUGH the occurrence of bones of the Great Auk *Pinguinus impennis* in shell heaps of coastal southern New Brunswick and Maine is well documented, no such bones were identified in the considerable number of shell heaps in Nova Scotia examined by Wintenberg (Can. Field Nat. 33:63-72, 1919) and Smith and Wintenberg (Bull. nat. Mus. Canada 47:1-128, 1929). Recently the writer received for examination a number of bones collected in July 1957 by J. S. Erskine from a shell heap near Scotch Point, Port Joli, Queens County, Nova Scotia. Among them is a left humerus of the Great Auk, complete except for part of the distal end. Mr. Erskine provisionally dates this shell heap to sixteenth century. Because the occurrence of the Great Auk in Nova Scotia is so poorly documented it seems advisable to record these data.

The birds killed with sticks by Champlain's party on the Seal Island group (not Tusket Island), Nova Scotia, about May 20, 1604, are currently identified by authors as Great Auks. Champlain (*The Works of Samuel de Champlain*, Biggar ed., 1922, Vol. 1, p. 242) wrote: "... nous vîmes si grande quantité d'oiseaux appelez tanguaux, que nous les tuyos aisemet à coups de basto." Note that he did not say they were able to kill them because they were flightless but because there was so great a number.

The key word, however, is the bird name *tanguaux*. It need not concern us here that the origin of the word is obscure. What matters is what Champlain meant by it. For the answer to this, we have only to turn to his account of the

great Gannet colony on Bird Rocks, Magdalen Islands. He wrote: "... se sont deux rochers dans ledit golphe, où il y a telle quantité d'oyseaux appelez tangeux, qui ne se peut dire de plus, les vaisseaux passant par là quand il fait calme, avec leur batteau vont à ces Isles, & tuet de ces oyseaux à coups de batons, en telle quantité qu'ils veulent, ils sont gros comme des oyes, ils ont le bec fort dangereux, tous blacs hormis le bout des aisles qui est noir, se sont de bons pescheurs pour le poisson qu'ils prennent & portent sur leurs Isles, pour manger..."

Note that he described unmistakably the birds he called *tanguaux* (spelled here *tangeux*) as big as geese, with dangerous beaks; white in color except for their black wing tips. Moreover, as in the case of the Nova Scotia birds, he said that as many as needed could be killed with clubs. Clearly Champlain's *tanguaux* were Gannets *Morus bassanus*. Ornithologists apparently have read only English translations of Champlain in which *tanguaux* is usually rendered erroneously as 'penguins'. Ganong (Trans. roy. Soc. Canada, Ser. 3, Vol. 3:197-242, 1909) in his identification list of animal names mentioned by early voyagers wrongly identified *tanguaux* as Great Auks, but later in the Biggar edition of Champlain he correctly rendered the word as Gannets, the only translator to do so to my knowledge.

W. EARL GODFREY

National Museum of Canada
Ottawa, Ontario
4 November 1958

Golden Plover in Nova Scotia

MY FIELD NOTES concerning Nova Scotia birds date back to the late nineties but they do not go quite far enough back to record the large flocks of American Golden Plover *Pluvialis dominica dominica* that customarily fed on the upland pasturelands above the town of Wolfville during late August and September. The last year these notable flights occurred was about 1890. My older brother,

Dr. H. F. Tufts, remembers well that some of the prominent sportsmen of the period went regularly in the early fall to these fields where large numbers of plovers were killed. They used skillfully made decoys, 'profiles,' cut from metal sheets and it was said that the birds, completely fooled by the deception, came in without hesitation. My brother recalls that there was an element of secrecy among the hunters in respect of the best places to go, obviously an attempt to keep the sport for themselves. By 1895, however, these birds had decreased so markedly that the shooting, in this area at least, was no longer profitable. Though there was much speculation at the time, no one knew what had happened to them.

During the years that followed, Golden Plover, as indicated by my records, were relatively rare birds. When seen at all they were intermingled with flocks of Black-bellied Plover, usually in very small numbers, or were sometimes observed at Evangeline Beach, Kings County, in singles at the edge of the tide.

On September 5, 1958, while I was searching for mushrooms in a farming district northwest of Berwick, Kings County, I noticed my spaniel chasing a large flock of birds that were flying in close formation at a considerable distance. Soon they wheeled past me at close range uttering their soft fluted call notes and I saw that they were definitely Golden Plover, the largest congregation by far that I had ever seen. They circled about for some time, finally alighting in another field a few hundred yards distant. I estimated their number at 125.

The district was not visited again until September 17. On this date they were still in evidence, but in another field near by, and it was apparent that their numbers had increased. Watching them from my car on an adjacent highway through a 25-power scope, I noted that well over half were the mottled gray birds of the year, the adults being readily distinguishable by their darker plumage. They were running, then stopping abruptly, robin-like, all over a low-lying and closely

cropped, four-acre pasture, and a conservative estimate placed their number at 300. They were obviously feeding but as no berries were available they must have been taking insects. The birds were not wary, those nearest the highway being within 25 yards of where I was sitting. I visited the area again on September 20 when a careful search was made but no Golden Plover were seen.

ROBIE W. TUFTS

Wolfville, Nova Scotia

4 December 1958

Spring Emergence of the Western Chorus Frog

OVER a period of five years, the writer recorded observations on the spring emergence of the western chorus frog *Pseudacris nigrita triseriata* at Gleneagle, near Chelsea, Quebec, and at Overbrook in Ottawa, Ontario.

Although Gleneagle is only 11 miles north of Ottawa, the western chorus frog may appear there as much as two weeks after it has appeared in Ottawa. In 1958 it was first heard at Gleneagle on April 14, at Overbrook on March 29. The earliest date of emergence at Gleneagle is April 14 (1958), at Overbrook, March 28 (1957). The latest date at Gleneagle is April 16 (1955), at Overbrook, April 4 (1956).

At Gleneagle there are heavily wooded sections which border the open fields, and the altitude is 400 to 600 feet. At Overbrook the terrain is flatter; there is much more grassland and the altitude is only 250 feet. Probably the height of land and associated cooler temperatures account for the difference in the spring appearances.

It is of interest that the frogs from the shaded, cooler woodland ponds of Gleneagle are, on the average, smaller than those from the open, warmer ponds in fields at Overbrook.

STANLEY W. GORHAM

National Museum of Canada

Ottawa, Ontario

14 November 1958

History of the Cottontail in Manitoba

THE FIRST cottontail rabbit (*Sylvilagus floridanus similis*) recorded for Manitoba was taken north of Treesbank in 1929, yet pioneers who had hunted through the Tiger Hills and far to the south and east in the early eighteen eighties have told me that some years they shot nearly as many cottontail rabbits as they did snowshoe hares, although during other years both were scarce and they hardly saw any. This seems to indicate that the cottontail was subject to strong fluctuations, also that these rabbits were just as well known then as they are today.

Some years ago, while examining a variety of old bones taken from an ancient Indian village site at the head of Rock Lake, I found the lower jaw of a lagomorph. On comparing it with specimens in my own collection I was able to identify it as that of a young cottontail rabbit. Mr. Chris Vickers who has done a great deal of exploratory work at the village site told me that the lower deposits were between 200 and 300 years old, perhaps older. So we must assume that the cottontail rabbit lived in the district when Indians hunted through it at least 250 years ago and that the cottontail rabbit has inhabited the district ever since.

STUART CRIDDLE

Aweme

Treesbank, Manitoba
26 February 1959

Magpie Specimen from Wrigley, N.W.T.

IN MAY of 1958 an Indian trapper, Louis Baptiste, of Wrigley, N.W.T., shot a bird there which was unknown to him or to other natives of the area. Louis was sufficiently interested in his find to skin the specimen and to save it to show to the local game officer when he called later

in the spring. The bird was identified by the game officer as a Black-billed Magpie *Pica pica* and it was subsequently purchased by the author and donated to the National Museum of Canada. Mr. Earl Godfrey of the National Museum kindly checked literature references to the species. The Wrigley specimen appears to constitute the northernmost Mackenzie record. There appear to be no previous records of the species having been taken north of Great Slave Lake although a general northward movement during the present century has been noted by Höhn and Robinson (Can. Field Nat. 65: 118, 1950).

The location of Wrigley is approximately 63° 07' North 123° 37' West.

JOSEPH E. BRYANT

Fort Smith, N.W.T.

29 January 1959

Nesting of the Golden Eagle at Sugluk Inlet, Ungava, Quebec

THE FOLLOWING observation extends northward the known breeding range of the Golden Eagle *Aquila chrysaetos* L. east of Hudson Bay beyond that of the Finger Lake--Leaf Bay site reported in 1953 by Bateman (Intermediate Naturalist 8:1-7). The position is, however, considerably south of the Repulse Bay region on the west side of Hudson Bay, indicated as a probable breeding region by Snyder (Can. Field. Nat. 63:39-41, 1949).

During the trip through Hudson Strait in the early summer of 1952, Dr. Hazel Ellis Loomis investigated a reported 'Duck Hawk' nest at a nearby cliff where she was ashore at Sugluk Inlet. No falcons were present, but a large brush nest on the cliff was attended by two Golden Eagles.

WALTER R. SPOFFORD

766 Irving Ave.
Syracuse 10, N.Y.
10 January 1959

REVIEWS

**Biological Research in Conservation—
A Symposium**

By ARTHUR B. MEYER and others. National Society for Medical Research, 920 South Michigan Boulevard, Chicago 5, Illinois. Single copy: 25 cents [Bulletin for Medical Research, January-February 1959, Vol. 13, No. 1]

"We publish this symposium with the hope that it might advance the day when conservation policy stems directly from the best available scientific knowledge—when sportsmen, farmers and citizens everywhere understand and appreciate the precious insight of the conservation scientist as they now are beginning to appreciate the creative genius of chemists, physicists and medical scientists."

Those words conclude the editorial of the January-February 1959 issue of the Bulletin for Medical Research and explain why the National Society for Medical Research should devote almost a whole issue of its bimonthly bulletin to five articles under the heading "Biological Research in Conservation." Those articles, of a few pages each, prepared by leaders in the several fields, furnish in very limited space as brief and as comprehensive a presentation of the broad field of renewable resource conservation as it has been the reviewer's pleasure to examine.

In "Conservation as a Profession" Arthur B. Meyer, Editor, Society of American Foresters, traces the trend of development in the field from the early work in forestry to the present ideas on multiple resource use. The growth of professional societies in the many fields of resource use is mentioned as an index of the increasing maturity of the sciences concerned. The complexity of interrelations between the members of the ecological community is demonstrated throughout the article.

Wildlife diseases with their parallels in human ills as well as the part played by wildlife in the spread of certain human diseases are discussed by Dr. Carleton M.

Herman, Chief, Section of Wildlife Diseases, Patuxent Research Refuge, United States Fish and Wildlife Service.

Paul E. Thompson, Chief, Branch of Fishery Research, United States Fish and Wildlife Service, reports on "Fishery Research and Conservation" from the discounting of the importance of stocking hatchery fish as a cure-all for poor fishing, to means of removing undesirable fish. The section dealing with changes in regulations covers much more than the impact on the fish themselves of such changes.

The article on the Patuxent Research Refuge written by its Director, Dr. A. L. Nelson, gives a clear picture of the types of problems which may be investigated at such an institution. They range from studies of wildlife mortality, food habits, distribution and migration and effects of insecticides and other chemicals, to the relation between agricultural practices and the wildlife living on farm lands.

In his section entitled "Conservation Biology—Fact and Fallacies," Dr. Durward L. Allen, Professor of Wildlife Management, Purdue University, gives a critical review of some of the generalities of conservation. He assesses present public understanding of ecological principles and decries the waste of funds and of trained manpower in the conservation field through lack of understanding by the public. (His classic on the subject, "Our Wildlife Legacy," was reviewed in Vol. 69, No. 1, of the Canadian Field-Naturalist).

By having the articles written simply and concisely by specialists and illustrated by well-captioned photographs, the editor of this bulletin has rendered its readers an excellent service. It is to be hoped that regular readers will pass on their copies to friends so that this excellent presentation may reach the widest possible audience.

VICTOR E. F. SOLMAN —
Canadian Wildlife Service

The Mammals of North America

By E. RAYMOND HALL and KEITH R. KELSON.
New York, 1959. 2 volume set, 1083 p.
\$35.00.

The publication of this comprehensive two-volume work on the mammals of North and Central America marks a milestone in the history of mammalogy as a distinct branch of zoology. It reflects the rapid development which the study of mammals has enjoyed in the last few decades and it will certainly stimulate further study and research. For many years mammalogists have suffered from the lack of a comprehensive treatise such as the present one. This is a situation that has handicapped professionals and tended to discourage serious amateurs.

This work covers every named species and subspecies occurring in North and Central America, including Greenland and the West Indies south to Grenada. According to the authors, 3,800 named forms are treated. All mammals are regarded as having a common ancestor, and the marsupials and placentals are treated as Infraclasses. For each taxonomic category from the Class down to the species, there is a brief description in which the diagnostic characters are given. In addition there are artificial keys to the species. The subspecies are treated under the species headings and arranged in alphabetical order, which makes for easy reference. Synonymy for each race is given, as well as marginal records that roughly define the distributional limits of the subspecies.

Particularly commendable are the range maps on which are plotted the marginal records given in the text. On the basis of these and other uncited records, the authors have drawn approximate ranges for each subspecies. Thus, at a glance, it is possible for the reader to determine, quite accurately, the probable range of any given race. The authors carefully point out, in the preface—and this should be borne in mind by anyone consulting these maps—that most of the subspecies ranges are mere guesses. On checking those species with

which he is particularly familiar, this reviewer has found that these guesses are surprisingly accurate. Naturally, some groups are more difficult to map than others, particularly migratory species. Considering the pitfalls that beset the author courageous enough to attempt the preparation of range maps, the maps in the present volumes are truly remarkable.

Another admirable feature is the bibliography, which shows evidence of an exhaustive search of the literature. Workers who do not have access to a large library will find this section of particular value. The literature is remarkably up to date and many of the papers, cited in the main text, are as recent as November 1957. An "Addenda" section, on pages 1079-1083, includes more recent records some of which were published as late as August 1958.

Many of the species are illustrated by small line drawings which give the reader a general idea of the appearance of the animals in question. They are obviously not intended as aids to identification. The skulls of almost all species are figured, most of them from two or three aspects. Although the skulls of many species might be identified by means of these drawings, it is doubtful if either the amateur or the professional will find them particularly useful. In the case of the smaller rodents, for example, large-scale drawings of the molar tooth patterns would have been far more useful for the nontaxonomist. Likewise, large-scale outlines of the tooththrows in many of the shrews would have been a valuable aid where variation in tooth size is a diagnostic character.

The Mammals of North America is a set no professional or serious amateur mammalogist can afford to be without. It is a reference to which he will turn constantly and, after having grown accustomed to consulting it, will wonder how he managed without it. The authors are to be complimented for having produced a work so admirably suited to the needs of the working mammalogist and

the publishers deserve credit for the excellence of both the printing and the binding, so important a matter for books that will be used as frequently as these volumes are certain to be.

AUSTIN W. CAMERON

Curator of Mammals
National Museum of Canada

The Birds of Alaska

By IRA N. GABRIELSON and FREDERICK C. LINCOLN. Harrisburg, Stackpole; and Washington, Wildlife Management Institute; 1959. 952 p., illus. \$15.00.

This impressive volume, 14 years in preparation, brings together a vast amount of information on Alaskan birds heretofore widely scattered in the literature, in institution files and in field notebooks. It is a most welcome addition to the ornithological literature of North America. The authors recognize 321 species represented by 414 subspecies as occurring or having occurred in Alaska. The 52-page introduction includes a valuable history of Alaskan ornithology together with accounts of the ecological zones, migration, and some interesting aspects of the birds of that state which is, in many ways, a unique part of this continent. The 55-page bibliography gives some idea of the magnitude of the work.

The species accounts are divided into five primary categories usually including: (1) English, scientific, and native names; (2) descriptions of the adults, some of the more significant immature plumages including the down; also the nest and eggs; (3) general range; (4) range in Alaska; and (5) haunts and habits. The sections dealing with distribution in Alaska are unusually detailed, well documented, and definite. They contain, also, a more than usual amount of data on migration routes. The gathering, screening, documenting, and organizing of this great mass of distributional detail is a mammoth undertaking deserving the gratitude of all students of bird distribution.

Vernacular names for subspecies are used, perhaps because it was customary to use them when the authors first planned the book several years ago. In most cases the name for the species as a whole would be obvious to the amateur and therefore would not cause any difficulty. In certain cases, however, where but one race of a polytypic species is found in Alaska, no name for the species is provided. Eurasian Knot and European Turnstone are examples of misleading names because it now turns out that these races are holarctic. They breed not only in the general range postulated for them by the authors of this book but also in the northern periphery of their respective ranges right across northern Canada. It would seem that subspecies vernaculars have outlived their usefulness.

Scientific nomenclature and general ranges of the races concerned conform in most but not all cases with the fifth edition of the A. O. U. *Check-list of North American Birds*. One outstanding exception is found in the Gray Jays. For some reason the authors refer the Alaskan population to *arcus* Miller. This name was proposed in 1950 as a substitute name for *pacificus* Miller, not *pacifus* Gmelin. What, if anything, *arcus* has to do with the Alaskan population is not evident.

The descriptions of the birds are adapted from several sources. Generally they seem good enough but random readings show evidence of uneven quality. The loons are an example. The winter plumage of the adult *Gavia adamsii* is described in considerable detail but of the breeding plumage little more than parts of the neck and throat are accounted for. No mention is made of the color of the shafts of the primaries, the one useful diagnostic plumage character for separating all plumages, after the down, from those of the similar *immar*. In *Gavia arctica* the description of the adult winter plumage is too sketchy to convey much of a con-

cept of its appearance. Immatures are described as "similar to corresponding plumage of other loons"!

The descriptions of the cormorants also are of uneven quality. In the case of the Double-crested the reader is compelled to wade through a mass of description which includes family characters and is told that the adult is a large black or brown (!) bird. In the description of the nuptial plumage of the Red-faced Cormorant the conspicuous white flank patches are overlooked. The colored plate of the Pelagic and Red-faced Cormorants will not do much to help the beginner. In an inadequately illustrated book such as this, more emphasis on characters useful in separating similar species would be helpful to the novice.

For the Spruce Grouse, the size of egg clutch is given as usually 10 to a dozen but up to 14 or even 16. This presumably is from Bent (1932, U.S. Nat. Mus. Bull. 162:123) but Bent (in the same work, p. 130) with reference to the "Alaska" Spruce Grouse gave figures from 5 to 8. Rand (1947, Can. Field Nat. 61:127-130) concluded that the normal clutch size in that species is 4 to 7, occasionally more, with little evidence of geographical variation.

The book is well printed with very few typographical errors. A few scientific names such as *Oporornis*, *arcticola*, *interpres*, *maximiliani*, and *cinnamomea* are consistently misspelled.

In a work of this magnitude it is easy to find small faults, and the listing of them tends to overemphasize their importance. These days, the primary function of a regional bird book is to make available definite information on the birds of that particular region. This the authors have done commendably and the work will doubtless be the standard reference on Alaskan birds for a long time to come.

W. EARL GODFREY

Curator of Ornithology
National Museum of Canada

The Freshwater Fishes of Canada

By E. P. SLASTENENKO. Toronto, Kiev Printers, 1958. 385 p. \$15.00.

This is the first book to appear covering all the fresh-water fishes of Canada. Included are keys to and descriptions of the families, species and subspecies; synonymies; and information on distribution and life history. A glossary, a distributional checklist and a list of references are presented at the end of the book.

The keys are on the whole good, although they break down in places. Some times no morphological characters are given. However, the book is a welcome change from the current trend to over-popularize; synonyms are given and the descriptions are usually scientific and adequate. Although a fairly comprehensive glossary is given it is felt that a few drawings would have greatly aided in the understanding of terms. Inset drawings would also be valuable in the keys.

Unfortunately there are several features which mar this work. Two pages of errata are given and all errors are not included. Words at the end of the lines are often improperly broken and typographical errors are numerous. Most species are illustrated by poorly copied, often muddy looking figures derived from other ichthyological books. Some of the sources of the illustrations are not acknowledged. The map on the last page is almost illegible. The light binding, of paper, does not make the book sturdy enough for field use.

The nomenclature varies considerably from current practice. *Baione*, a monotypic genus for the brook trout which has been synonymized with *Salvelinus* for over 100 years, has been resurrected.

The retention of subspecies in *Salmo gairdneri*, *S. salar*, *Oncorhynchus nerka* and *Couesius plumbeus* is not in accordance with recent papers. The river lamprey of the west coast has been shown to be distinct from *Lampetra fluviatilis* and should be called *L. ayresii*. *Morone* must be considered a synonym of *Roccus*. Although *Amiurus* is retained (generally

now considered a synonym of *Ictalurus*), the family name Ictaluridae is used. The synonymies of at least *Entosphenus japonicus*, *Salvelinus alpinus*, *Perca flavescens*, *Trigloopsis thompsoni*, *Cottus ricei*, and *Cottus asper* are incomplete. *Cottus punctulatus* is not known from British Columbia. As the author admits in the introduction, the book is based chiefly on the literature. To this fact many of the weaknesses may be attributed.

The Freshwater Fishes of Canada will prove useful for people in those provinces not covered by regional studies. Its more technical nature will tend to restrict its use to the serious amateur, the fishery biologist and the ichthyologist. The poor illustrations, paper binding and frequent errors combine to make the price of \$15 altogether too high.

D. E. McALLISTER

National Museum of Canada
Curator of Fishes

General Biology

By JAMES WATT MAJOR. 5th ed. New York, Macmillan, 1959. 695 p. \$6.75.

This standard introductory text to general biology that has been the guide and mentor of so many generations of embryonic biologists has now reached its fifth edition. In general the format has not changed much but the details concerning the nature of the cell and the genetics have been considerably revised. It is still, however, my feeling that the former of these divisions might have been expanded and more emphasis placed on the dynamics of the cell and an attempt made to incorporate some of the recent speculations concerning the origin of life on this planet.

The second part of the book, that dealing with plant life, is, as in the previous edition, somewhat slighted, especially when this book purposes to be a text of general biology. Such topics as plant succession and the evolution of the higher Tracheophyta, controversial as this latter may be, might have been included. Again, as in the case of the cell, I have the impression that the chapter devoted to plant physiology could have been pre-

sented in a more dynamic fashion.

As in former editions, the zoological sections are well done. Part 3 dealing with animal life traces the development of the invertebrate and vertebrate groups. Little attempt has been made to explain phylogenetic relationships. Part 4 discusses the comparative anatomical aspect of vertebrate anatomy and physiology. Part 5 is devoted to development and heredity; here again, the section dealing in human heredity could have been expanded to include more work on the inheritance of human defects, as for many students this particular information will be their sole introduction to this pertinent subject. The concluding section of the book summarizes very clearly and successfully our view on the organic world and the modern theories of evolution. This edition, like its predecessor, has two invaluable appendixes, one a table of the plant and animal kingdoms with pronunciation of names and a second, a glossary of technical terms.

The book is well printed, bound and illustrated. Most of the figures appear to be new, but a few old favorites have maintained their popularity. In all, this is a book to be recommended as a good text for a two-semester introductory biology course.

H. H. J. NESBITT

Biology Department
Carleton University
Ottawa, Ontario

Lead Poisoning as a Mortality Factor in Waterfowl Populations

By FRANK C. BELLROSE. Urbana, State of Illinois, Natural History Survey Division. 50 cents (Bull. Ill. nat. Hist. Surv. 27(3): 235-288. 1959)

Lead poisoning, caused by waterfowl eating lead shot while feeding in shallow water, in areas where long-continued shooting has taken place, is an important cause of mortality. The present report form a comprehensive review of the whole problem, including a discussion of possible solutions, prepared by the investigator who has taken a most active part in research on the subject.

VICTOR E. F. SOLMAN

Canadian Wildlife Service

AFFILIATED SOCIETIES

British Columbia Bird and Mammal Society

President, M. D. F. UDVARDY, Dept. of Zoology, University of British Columbia, Vancouver 8, B.C.

Edmonton Bird Club

President, PROF. W. R. SALT; *Vice-President*, DR. K. BALL, *Secretary-Treasurer*, W. G. LAWRENCE TWIGGE, 11343 67th St., Edmonton, Alta.; *Field Secretary*, H. C. PEGG; *Audubon Representative*, R. HEATH; *Editor*, E. O. HÖHN; *Librarian*, G. BALL.

McIlwraith Ornithological Club

Past President, DR. W. W. JUDD; *President*, H. A. U. MONRO; *Vice-President*, DR. F. S. COOK; *Recording Secretary*, D. DOW; *Treasurer*, MISS M. MACPHERSON; *Corresponding Secretary*, MRS. M. E. LEAHY, 682 Huron St., London, Ont.; *Migration Secretary*, J. W. LEACH, 376 Platt's Lane, S.S. 3, London, Ont.

Natural History Society of Manitoba

President, DR. J. C. RITCHIE; *Treasurer*, HAROLD MASSOP; *General Secretary*, E. DOWTON, 47 Cunnington Ave., Winnipeg 8, Manitoba.

Nova Scotia Bird Society

President, DR. HARRISON F. LEWIS; *Vice-President*, C. R. K. ALLEN; *Secretary-Treasurer*, MRS. S. WARD HEMEON, c/o Nova Scotia Museum of Science, Spring Garden Road, Halifax, N.S.; *Editor*, DR. LLOYD B. MACPHERSON.

Provancher Society of Natural History of Canada

President, J. KENNEDY HILL; *First Vice-President*, FRANCOIS HAMEL; *Second Vice-President*, RONALD E. BLAIR; *Secretary-Treasurer*, GEORGES A. LECLERC, 628 Fraser St., Quebec, Que.

Province of Quebec Society for the Protection of Birds

President, C. C. SALT; *Vice-Presidents*, J. DELA-FIELD, MISS R. B. BLANCHARD; *Treasurer*, MISS G. E. HIBBARD; *Secretary*, MISS RUTH S. ABBOTT, 164 Senneville Road, R.R. 1, Ste. Anne de Bellevue, Que.; *Librarian*, MRS. P. H. DU BOULAY.

Toronto Field Naturalists' Club

President, A. A. OUTRAM; *Vice-President*, FRED BODSWORTH; *Secretary-Treasurer*, MRS. HILTON ROBSON, 49 Craighurst Avenue, Toronto 12, Ont.; *Assistant Secretary*, MRS. J. B. STEWART; *Junior T.F.N.C.*, DON BURTON.

Vancouver Natural History Society

Honorary President, N. A. M. MACKENZIE; *Past President*, A. R. WOOLTON; *President*, J. J. PLOMMER; *Vice-President*, FRANK SANFORD; *Honorary Secretary*, J. Y. NEILD; *Recording Secretary*, MISS ETHEL FUGLER; *Program Secretary*, JOHN GARDNER; *Honorary Treasurer*, FRANK SANFORD; *Librarian*, MRS. S. F. BRADLEY; *Editor of Bulletin*, C. B. W. ROGERS.

ADVICE TO CONTRIBUTORS

Manuscripts

Manuscripts should be typewritten on one side of nontransparent paper measuring 8½ by 11 inches. Authors are requested to use at least one given name. All text matter, including quotations, footnotes, tables, literature references, and legends for figures should be double-spaced. Only those words meant to appear in italics should be underlined. Every sheet of the manuscript should be numbered.

Webster's New International Dictionary is the authority for spelling.

References are made by the author-date system. They should be listed alphabetically and typed at the end of the main body of text. For titles in reference matter, abbreviations follow the rules in the *International Code for the Abbreviation of Titles of Periodicals* and the *World List of Scientific Periodicals*.

Other abbreviations should be used sparingly. The better-known terms of measurement follow CSA Specification Z85-1943 *Abbreviations for Scientific and Engineering Terms* or the equivalent of the American Standards Association (Z10.1-1941).

Tables should be titled and numbered consecutively in arabic numerals. Tables and legends for the figures should be placed after the list of references. Each table and all the legends should be on separate pages.

Notes should bear the name of one author only

and references in notes should be incorporated directly in the text.

Illustrations

All figures, including each figure of the plates, should be numbered consecutively in arabic numerals. The author's name, title of the paper, and figure number should be written in the lower left corner of the sheet on which the illustration appears. The legend should not be incorporated in the figure.

Line drawings should be made with India ink on white drawing paper, blue tracing linen, or blue-lined co-ordinate paper. Co-ordinate lines that are to appear in the reproduction should be ruled in black ink. Descriptive matter should be lettered, not typewritten, and all parts of the drawing should permit easy legibility even if a reduction is made.

Photographs should have a glossy finish and show sharp contrasts. For reproduction as a complete plate they should be mounted without space between prints.

For large drawings and mounted photographs the ratio of height to width should conform to that of the journal page (4½ by 7½ inches) but the height should be adjusted to allow for the legend.

Reprints

Reprints, with or without covers, may be bought. The cost is given on the reprint order form which is attached to the galley proofs.

The CANADIAN FIELD-NATURALIST

Published by THE OTTAWA FIELD-NATURALISTS' CLUB, Ottawa, Ontario

ANNUAL MEETING

The annual meeting of the Ottawa Field-Naturalists' Club will be held on Thursday, December 3, 1959, at 8.15 p.m., in the Ottawa Teachers' College, Lisgar Street.

Articles

- William Henry Lanceley, 1893-1958 HOYES LLOYD 183
A Re-evaluation of the Subspecies of Fisher EDWIN M. HAGMEIER 185
Postglacial Dispersal of the Western Chorus Frog in Eastern Canada SHERMAN BLEAKNEY 197

Note

- Picoides arcticus* Nesting in the Cariboo, British Columbia ANTHONY J. ERSKINE 205

INDEX TO VOLUME 73

Compiled by JOHN M. GILLET and LESLIE JENKINS 206

Can. Field Nat.

Vol. 73

No. 4

p. 183-218 (end)

Ottawa, October-December 1959

THE OTTAWA FIELD-NATURALISTS' CLUB

FOUNDED IN 1879

The objects of the club are to foster an acquaintance with and a love of nature, to encourage investigation and to publish the results of original research and observations in all branches of natural history. The club is a corporate member of the Federation of Ontario Naturalists.

MEMBERS OF COUNCIL

EDWARD L. BOUSFIELD, *President*, National Museum of Canada, Ottawa, Ontario
W. WINSTON MAIR, *First Vice-President*
DONALD R. BECKETT, *Second Vice-President*
JOHN M. GILLET, *Treasurer*, Plant Row Institute, Central Experimental Farm, Ottawa, Ontario
A. W. FRANK BANFIELD, *Secretary*, National Museum of Canada, Ottawa, Ontario
I. L. CONNERS, C. FRANKTON, *Auditors*
MRS. JOHN W. ARNOLD, MISS ANNE BANNING, MISS CHARLOTTE DILL, MRS. JOHN HAWKS-BRIDGE, MISS VIOLET HUMPHRIES, MISS PAULINE SNURE, THE REVEREND F. E. BANIM, MESSRS. J. W. ARNOLD, W. K. W. BALDWIN, D. R. BECKETT, B. BOIVIN, A. E. BOURGUIGNON, K. BOWLES, A. W. CAMERON, W. J. CODY, I. L. CONNERS, C. FRANKTON, R. FRITH, W. E. GODFREY, H. GROH, J. W. GROVES, R. A. HAMILTON, W. I. ILLMAN, H. LLOYD, R. J. MOORE, C. R. PATTERSON, A. E. PORSILD, L. S. RUSSELL, D. B. O. SAVILE, H. J. SCOGGAN, G. W. SINCLAIR, V. E. F. SOLMAN, J. S. TENER.

THE CANADIAN FIELD-NATURALIST

ROBERT A. HAMILTON, *Editor*
K. W. Neatby Building, Ottawa, Ontario

W. J. CODY, *Business Manager*
Central Experimental Farm, Ottawa, Ontario

Associate Editors: F. J. ALCOCK (Geology), JOHN W. ARNOLD (Entomology), W. A. BELL (Paleontology), J. SHERMAN BLEAKNEY (Herpetology), AUSTIN W. CAMERON (Mammalogy), WILLIAM G. DORE (Botany), J. R. DYMOND (Ichthyology), W. EARL GODFREY (Ornithology), A. G. HUNTSMAN (Marine Biology), A. LAROCQUE (Conchology).

The Canadian Field-Naturalist is published quarterly by the Ottawa Field-Naturalists' Club with the assistance of affiliated societies listed on the inside back cover. Manuscripts representing personal observations or the results of original research in any branch of natural history are invited. In the preparation of papers authors should consult the most recent issue and the information for contributors on the inside back cover. Advertising rates and prices of back numbers of this journal and its predecessors, *TRANSACTIONS OF THE OTTAWA FIELD-NATURALISTS' CLUB*, 1879-1886, and the *OTTAWA NATURALIST*, 1887-1919, are obtainable from the business manager.

MEMBERSHIP AND SUBSCRIPTION

The annual membership fee of \$4.00 covers subscription to the journal. Institutions, however, may subscribe at the same rate as that for membership. Single current numbers of regular issues are one dollar. Money orders should be made payable to the Ottawa Field-Naturalists' Club and sent to the treasurer. Notice of change of address should also be sent to the treasurer.

The Canadian Field-Naturalist

VOLUME 73

OCTOBER-DECEMBER 1959

NUMBER 4

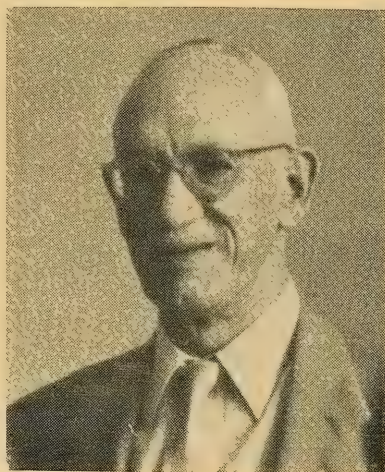
WILLIAM HENRY LANCELEY

1893-1958

IN THE DEATH of W. H. Lanceley on October 20, 1958, the Ottawa Field-Naturalists' Club suffered the loss of a member who had been active in its affairs for thirty-two years. He was born at Portsmouth, England, on September 17, 1893, came to Canada in 1909, and after living in Manitoba, joined the staff of the Post Office Department at Ottawa in 1913 and was employed there until his war service intervened in 1915.

His military and civil service careers ran parallel. He joined the Governor General's Foot Guards in 1913, and, in 1914, the 77th (Ottawa) Battalion, C.E.F. When this battalion was broken up in England he was placed with the 4th Battalion of the Canadian Railway Troops and served with that unit in France and Belgium until December 1917.

He resumed his connection with the Governor General's Foot Guards upon returning to Canada in 1918, was promoted Regimental Quartermaster Sergeant and, as such, represented the Guards at the coronation of H. M. King George VI in 1937. He was placed on the retired list with rank of captain in 1947. Even then his military life was not ended, for he rejoined his regiment in 1955 to become curator of the regimental museum and secretary to the board. Military honors were: European war medal, 1914-18; Victory medal; Colonial Auxiliary Forces Long Service medal; Coronation medal, 1937; Efficiency Decoration; and Coronation medal, 1953.



W. H. Lanceley

Upon return from Europe he again entered the Post Office Department and, in 1919, transferred to the Department of Labour. In 1922 his unit was transferred to the Dominion Bureau of Statistics where he served until his retirement on September 16, 1958. For seventeen years he was on the staff of the Canada Year Book section; then in 1944 he became chief of the Animal Products Section and continued in that position. Both his associates of the Bureau and the representatives of the industry with which his work was concerned took part in his farewell ceremony and expressed appreciation for his long service and for his success in making personal the functions of the Bureau.

Mailing date of this number: 25 November, 1959

In 1919 Mr. Lanceley married Alice Abbott of Ottawa who survives him. He was an Anglican, an active member of St. Bartholomew's Church, a lay reader and former church warden.

It was his interest in birds and their protection that brought Mr. Lanceley in contact with the Ottawa Field-Naturalists' Club. He soon recognized that the best remedy for thoughtless bird destruction was education, and therefore took upon himself continuing duties connected with field excursions.

Mr. Lanceley joined the Club in 1926 and the American Ornithologists' Union the same year. He was elected to our council in 1928 and held many offices including that of auditor from 1935 to 1946 and the presidency in 1947 and 1948. He continued on council till his death.

The Lanceley's bird feeding station was visited by a Pileated Woodpecker once, and, even stranger, by Redheaded Woodpeckers, up to five at a time, and over a period of three years. I know of no other Ottawa station having Red-headed Woodpeckers as customers.

Mr. Lanceley enjoyed the birds at home and afield. He was a regular Christmas Bird Census participant, and he spread his knowledge and assisted others to learn about and to enjoy birds through participation in our field excursions.

In summation I believe that Mr. Lanceley got a lot out of a varied career because he put a lot into it. We were fortunate that his energies allowed room for natural history and we have benefited thereby.

HOYES LLOYD

The Common Scoter on Cape Breton Island, Nova Scotia — a Correction

In my "Birds of Cape Breton Island, Nova Scotia" (Can. Field Nat. 72:7-27, 1958) the status given for the American (= Common) Scoter *Oidemia nigra americana* is exactly the same as that given for the Surf Scoter *Melanitta perspicillata*. These data are correct for the Surf Scoter. However, reference to my original handwritten manuscript shows that in copying this the typist inadvertently placed these same data also under "American Scoter". The correct version reads:

American Scoter. *Oidemia nigra americana* Swainson. Clarke (MS.) identified several at Aspy Bay on August 19, 1941.

W. EARL GODFREY

A RE-EVALUATION OF THE SUBSPECIES OF FISHER

EDWIN M. HAGMEIER

University of New Brunswick, Fredericton, New Brunswick

INTRODUCTION

THE FISHER *Martes pennanti* is currently divided into three subspecies: *M. p. pennanti*, *M. p. columbiana*, and *M. p. pacifica*. Two of these, *pennanti* and *pacifica*, were synonymized at approximately the time that the third, *columbiana*, was described (Grinnell, 1933; Grinnell, Dixon and Linsdale, 1937; and Goldman, 1935), so that some uncertainty exists over the validity of all three.

It is my purpose here to attempt a re-evaluation of these races, and at the same time, to present a brief synopsis of relevant taxonomic information.

The work reported is in part a portion of a thesis directed by Dr. I. McT. Cowan, presented to the University of British Columbia and in part the result of work carried out at the University of New Brunswick. Funds for support of the work were provided by the British Columbia Sugar Company, and the National Research Council of Canada. Acknowledgment is made of the assistance of Dr. Cowan, the curators of the museums who provided specimens for examination, and all others who have helped me.

TAXONOMIC SYNOPSIS

For the eighty-year period following Buffon's (1765) original description of the fisher, it was believed that two, and perhaps three species were represented. Gray (1843), Schinz (1845), and Audubon and Bachman (1845-1848) were responsible for the reduction of species to one, but it was not until the end of the century that stability of nomenclature was attained, and the specific epithet acknowledged to properly be *pennanti* (Baird, 1857; Coues, 1877; Rhoads, 1894 and 1898; and Allen, 1898).

Rhoads in 1898 described *M. p. pacifica* from the west coast as a distinctive subspecies, and in 1935 Goldman named *M. p. columbiana* from the Rocky Mountain region as a third form. No work, so far as I am aware, has extended the taxonomy of the fisher beyond Goldman's, which stands at present as authority on the subject.

Martes pennanti pennanti (Erxleben 1777)

Type locality: "North America" (Pennant, 1771); "New York and Pennsylvania... Must be restricted to the Alleghenian form" (Rhoads, 1898); "Canada" (Miller, 1899); "Eastern Canada" (Miller and Rehn, 1900); "Boreal America" (Elliot, 1901); "Eastern Canada, that is, Quebec" (Seton, 1929; also Miller and Kellogg, 1955).

Characteristics: The best account of fur color is given by deVos (1952), who examined a large series from Ontario. Local variation was found to be "fairly striking," with color of the back varying from pale gray to nearly black. Near-albinistic individuals were described by Richardson (1829) and Audubon and Bachman (1851-1854).

Little difference between average skins of various subspecies has been noted (Goldman, 1935; but see also Rhoads, 1898), although Bachrach (1946) reported that skins from east of the Manitoba-Ontario border averaged coarser and browner than those from farther west.

Total length, body length, and condylobasal length have heretofore been considered the best diagnostic characters of this race (Goldman, 1935; Grinnell, Dixon and Linsdale, 1937). *M. p. pennanti* is said to be about the size of *M. p. pacifica* in these characters, and both are reported smaller than *M. p. columbiana*.

Distribution: Throughout the species' range in eastern North America. Said by Goldman (1935) to occur no farther west than the Manitoba-Ontario border. This view was accepted by Anderson (1946) and Miller and Kellogg (1955), but all were noncommittal over the designation of material from Alberta, Saskatchewan and Manitoba, which is supposed to be intermediate between *pennanti* and *columbiana*. My impression, gained from Goldman, is that he meant fisher from the northern Prairie Provinces to be designated *columbiana*.

Martes pennanti pacifica (Rhoads 1898)

Type locality: "Lake Kichelos (Keechelus), Kittatass county, Washington; altitude about 8000 feet" (Rhoads, 1898; Miller, 1924).

Characteristics: Described by Rhoads (1898) as larger, tawnier in color, and with a distinctively colored underfur, when compared to *M. p. pennanti*. Grinnell (1933) and Grinnell, Dixon and Linsdale (1937) have shown, however, that variability in color in the two races is so great that the two are essentially identical. They showed further, that Rhoads' supposed female type was really a male, and that the two races are inseparable on the basis of size. It was on these grounds that they synonymized *pennanti* and *pacifica*.

Goldman's (1935) conclusions are essentially those of the above-mentioned workers. He did note, however, that *pacifica* tends to show a wider rostrum and a broader zygomatic arch than *pennanti*.

Distribution: The Coast Mountains, Cascade Range, and the Sierra Nevadas of western United States, and supposedly, the Coast Range of western British Columbia; northern limits of range not known (Goldman, 1935, Anderson, 1946).

Martes pennanti columbiana Goldman 1935

Type locality: "From Stuart Lake near headwaters of Fraser River, British Columbia" (Goldman, 1935).

Characteristics: Pelage indistinguishable from the two other races of fisher. It is considerably larger than either however, with skull larger and palate relatively longer (Goldman, 1935).

Distribution: Through the Rocky Mountains, and intermontane region of the species' range, presumably east into Manitoba (Goldman, 1935; Anderson, 1946).

NONGEOGRAPHIC VARIATION

Analysis of geographic variation must be grounded on some knowledge of nongeographic variation. The most important sources of the latter are, in general terms, sexual variation, age variation, seasonal variation, and individual variation.

Sexual variation

Linear measurements made on male fishers average about 1.17 times as large as the same measurements made on females from the same locality. This conclusion is based on the following evidence.

Subsamples were grouped by subspecies and by sex. Male measurements of three external characters (total length, tail length, and hind foot), and fourteen cranial characters (referred to elsewhere) were compared to the same measurements made on females. The average ratio resulting was 1.166. Female measurements were then multiplied by 1.166, and compared to the measurements made on males. In all cases t was insignificant at the .05 level of probability. The mean and standard deviation of this ratio for the cranial measurement most emphasized in this paper, condylobasal length, was found to $1.166 \pm .015$. In another test, the condylobasal lengths of 31 males were compared to those of 31 females from central British Columbia. The mean and standard deviation of the ratios resulting were $1.168 \pm .026$.

Most specimens examined had already been designated to sex by their collector. Where identity of sex had not been made, designation was made by fitting condylobasal length to frequency histograms made up from specimens of known sex.

Age variation

Variation due to age in fisher has been discussed in varying degrees of detail by Grinnell, Dixon and Linsdale (1937), and deVos (1952), among others. It appears that with age there is a grizzling and paling of the fur, increase in weight of baculum, and increase in weight, length, and change in proportion of the skull.

In the work reported here, division of material into two age classes only was attempted. Specimens with the nasomaxillary sutures still unfused were considered to be subadult, those with the sutures fused, or nearly fused, adults. By this criterion, a sample of 30 males from central British Columbia was separated into the two age classes, and cranial measurements of each compared by t . The following characters showed no statistical difference: length of upper tooth row, palate width, mastoid width, preorbital width, postorbital width, length and width of upper molar, waist of upper molar and length of upper sectorial. The following characters were found to show statistical differences: condylobasal length, canine width at base, rostral width, bulla length, and palate length. As a result of this test, those characters found to vary with age were measured only on specimens considered to be adult (by the nasomaxillary suture test). The remaining characters were measured on all specimens.

Seasonal variation

California fisher, according to Grinnell, Dixon and Linsdale (1937), undergo a complete molt in the fall, and a thinning of hair in the spring. The skins examined by me were divided therefore into three classes: summer, winter, and molting (the first two classes by date of capture, the third by appearance). Comparison of skins was made only within the two classes summer and winter.

Individual variation

Sixteen males from Ontario gave an average coefficient of variability of 6.17 percent for the three skin measurements, and thirty-three males from

central British Columbia an average of 4.10 percent for the fourteen cranial measurements taken.

Elsewhere I make use of condylobasal length for studying geographic variation. It is worth mentioning that the average coefficient of variation for condylobasal length in adult male fisher, when grouped by state and by province, was $2.25 \pm .71$ percent. All of these values are within the range of variability to be expected in natural populations, and indicate that individual variation, in the characters measured, is not unusual.

About forty skins, almost equally divided amongst the three subspecies, were carefully examined. These showed sufficient individual color variation to lead me to conclude that no criteria existed by which the subspecies could be separated.

COMPARISON OF THE SUBSPECIES OF FISHER

Method

During the course of the study 321 specimens of fisher were examined and cranial measurements were taken on 206 of these. Source of material and locations from which specimens were collected are given in appendix A, and on figure 1.

Grouping of the sample into subspecies subsamples was done on geographic grounds, the range limits set being those obtained from the literature. Four subsamples resulted: (1) from east of the Ontario-Manitoba border (*M. p. pennanti*); (2) from the Ontario-Manitoba border west to the eastern slopes of the Rocky Mountains (intergrades between *M. p. pennanti* and *M. p. columbiana*); (3) from the Rocky Mountains of the United States, and from the Rocky Mountains west to the eastern slopes of the Coast Range and Cascade Range of British Columbia (*M. p. columbiana*); and (4) from the Coast Range, Cascade Range, Coast Mountains and the Sierra Nevadas of the Pacific coast (*M. p. pacifica*). The geographic limits given to each of these is shown on figure 1.

Subsamples were further grouped according to age and sex by the methods outlined previously. On these grouped subsamples three external measurements and fourteen cranial measurements (listed in appendix B) were taken, and means, standard deviations, and standard errors computed. From these, Dice-Leraas diagrams (Dice and Leraas, 1936) were drawn up, and several are reproduced as figure 2. (See also appendix C.)

Results

Dice-Leraas diagrams are prepared by plotting the mean, and the mean plus and minus two standard errors of the mean, of each subsample. None overlap of the ranges resulting, is taken to indicate that the subsamples involved represent different populations at the .05 level of probability.

Several generalizations may be drawn from examination of the Dice-Leraas diagrams presented here.

(1) Variation in a single character often appears to be quite different in the two sexes. Since it is unlikely that geographic variation differs in the populations sampled, the differences that appear in the samples should likely be attributed to sampling error, and to the small size of the subsamples.



FIGURE 1. Localities from which specimens examined were originally collected. The solid line outlines the range of the species, the dotted lines mark the limits of the various subspecies.

(2) Each subsample (subspecies) can be shown to differ from each adjacent subsample (subspecies) in at least one character and usually several, and in at least one sex.

(3) Goldman (1935) maintained that fisher from eastern Canada and from the Pacific coast are smaller, that those from the Rocky Mountains are larger, and that those from the northern Great Plains are intermediate in size. My measurements indicate that this pattern of geographic variation is realized in some of the characters used, but not in all.

It has been pointed out by others that geographic variation in fisher is relatively slight (Grinnell, Dixon and Linsdale, 1937, Rand, 1945). An attempt has been made to compute variability within subspecies relative to that found between them. The coefficient of variability for the fourteen cranial characters measured within a subspecies, was found to average 3.76 ± 1.59 percent ($n = 112$), while variability between subspecies (taken as greatest difference between subsample means, divided by the mid-point of the greatest range

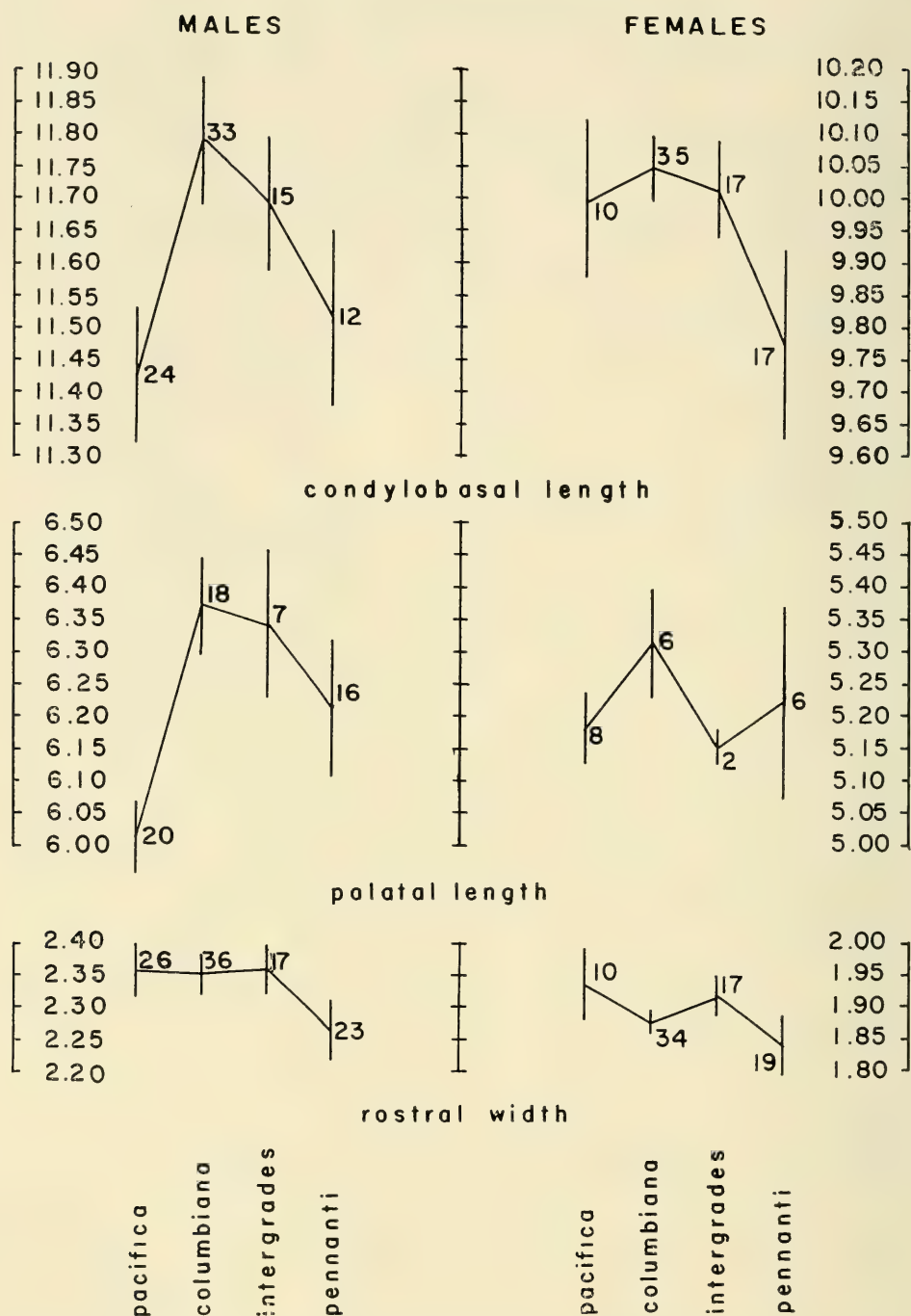


FIGURE 2. Dice-Leraas diagrams of three cranial characters. The mid-point of the horizontal lines marks the means of the subsamples. The ranges indicated by the horizontal lines indicate means plus and minus two standard errors of the mean. Measurements are in centimeters.

shown between subsamples) for the same characters, was found to average 3.88 ± 1.12 percent ($n = 28$). The ratio then, of variation between subspecies to variation within subspecies in the material used, is 3.88:3.76. These values were compared by means of t , and found to be not significant at the .01 level of probability: that is, not different, and hence in a 1:1 ratio. From this may be drawn a fourth conclusion:

(4) Differences between the most distinctively characterized subspecies of fisher have not been found to be any greater than the variation to be found within any single subspecies.

GEOGRAPHIC VARIATION IN CONDYLOBASAL LENGTH

I have outlined elsewhere (Hagmeier, 1958) my belief that systematic work at the subspecies level should begin with a study of geographic variation rather than with the naming of subspecies. The number of specimens of fisher available to me, however, has been so small that I have found it difficult to follow this precept. An attempt in this direction was made and the results are outlined here.

Method

Size appears to have been that single character of greatest use to other systematists of fisher. Two good estimates of size were employed during this study: total length and condylobasal length. Of these, only measurements of condylobasal length were made by me, all skin measurements having been copied from specimen tags. For these reasons, condylobasal length was selected as the most useful character for the study of geographic variation.

Grouping of subsamples by locality of capture was found to give subsample sizes too small for comparisons to be made. Grouping was done therefore by state and province. The ten subsamples resulting are given on figures 3 and 4.

So that subsample sizes might be increased still further, measurements taken from females were corrected to a male equivalent and pooled with measurements made on males. The method of correction was based on the conclusion (referred to previously) that measurements made on males averaged 1.167 times larger than the average of the same measurements made on females from the same locality. Measurements on the female portion of each subsample were multiplied by 1.167; and pooled with the measurements of the male portion.

Subsample means are plotted on figure 3. To assure significance of the results computed, an analysis of variance was calculated, and F resulting was found to be significant at the .01 level of probability. The t tests comparing the individual subsample means were also made, and the results are shown on figure 4.

Results

Maximum geographic variation in condylobasal length of male fisher, when grouped by state and province (and pooled with corrected measurements of females) is about .40 centimeters, or about 3.5 percent of the mean condylobasal length of all the subsamples. Specimens from California, Washington, Ontario and Michigan, Maine and New Hampshire, and Quebec have condylobasal lengths of about 11.50 centimeters or slightly less, while those from Montana

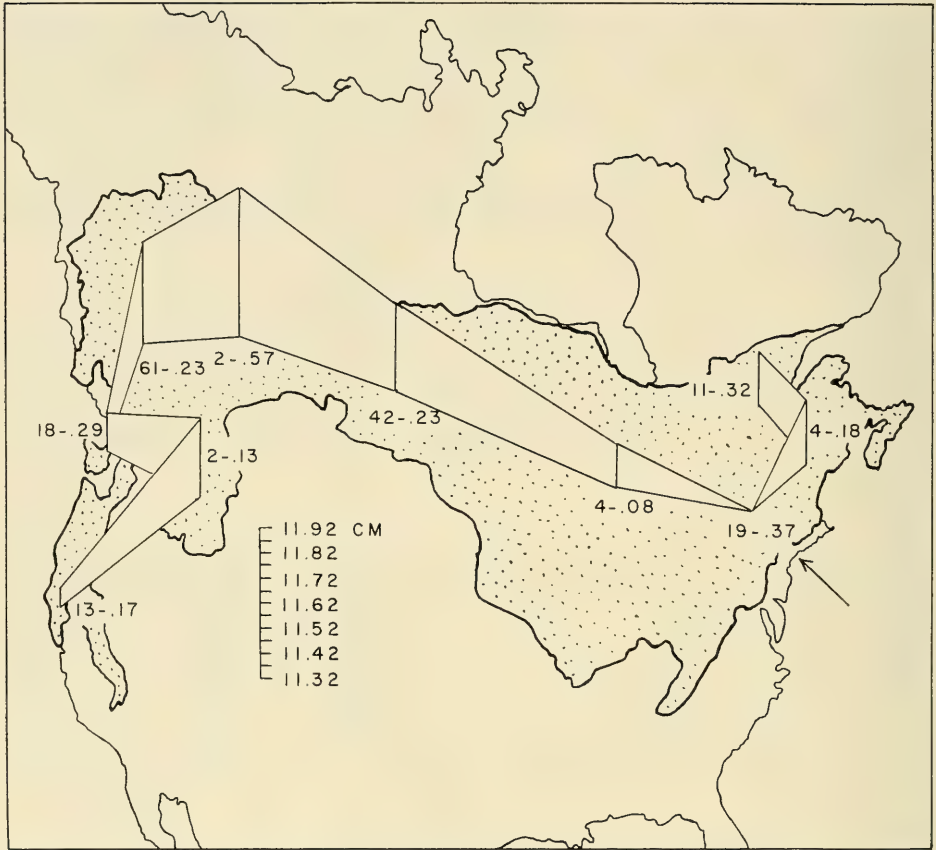


FIGURE 3. Geographic variation in condylobasal length of male fisher. The height of the pickets in the fence (representing condylobasal length) may be read from the accompanying scale. The digits at the base of each picket denote subsample size, and standard deviation. Thus the subsample from New York (marked by an arrow) has a mean condylobasal length of 11.32 cm, subsample size of 19 specimens, and a standard deviation of .37 cm.

and Idaho, British Columbia, Alberta, Manitoba and Saskatchewan, average about 11.75 centimeters. The differences appear to be significant (figure 4).

It may be hypothesized then, that a cline in condylobasal length exists, from a condition of relative smallness along the Pacific coast, to relative largeness in the region of the Rocky Mountains and Intermontane Plateau, and grading into a region of relative smallness again in eastern Canada and United States. It will be recollected that this pattern of variation is essentially that visualized by Goldman (1935), and that it was upon this interpretation that he based his acceptance of the three currently named subspecies of fisher.

DISCUSSION AND CONCLUSIONS

The major points brought out by the analyses described in the preceding account are, I believe, these:

it would be reasonable to refer all to a single, slightly variable species. I acknowledge, however, that these same points may lead others to contrary opinions, and I choose therefore not to be dogmatic or insistant in my view.

APPENDICES

A. Material examined

Abbreviations used in designating the source of the material examined are as follows: AMNH, American Museum of Natural History; BCPM, British Columbia Provincial Museum; BSC, United States Biological Survey Collection; NMC, National Museum of Canada; UBC, University of British Columbia Collection; UM, University of Michigan Collection; USNM, United States National Museum. Order of arrangement is alphabetical; no designation to subspecies is made, but may be obtained from figure 1. Numerals represent number of specimens examined.

Alberta: Fort Smith 1 (NMC); Peace River 2 (BSC); Prairie Creek, foothills of Rockies 2 (BSC);

British Columbia: no locality 4 (NMC); Albas, Sicamous P.O. 1 (BSC); Bear Lake 4 (BCPM); Beaver Pass, near Lightning Lake 1 (UM); Blue River 1 (UBC); Bowron River mouth, near Prince George 1 (BSC); Cache Creek 1 (BCPM); Cache Creek district 1 (UBC); Cameron River, Peace River district 1 (BCPM); Cariboo district 1 (UBC); Clisbake River, near Meridian 1 (BCPM); Cook Creek 1 (UBC); Cottonwood Creek, near Quesnel 2 (UBC); Driftwood River 1 (BCPM); Fort Grahame 5 (BSC); Fort Nelson 1 (UBC); Hemp Creek, Clearwater P.O. 1 (UBC); Hope Princeton Highway between Allison Pass and Big Burn 1 (UBC); Horsefly 2 (UBC); Kamloops district 2 (UBC); Little Prairie, Peace River district 2 (BCPM); Mildrum Creek 1 (UBC); Moosehead Lake 1 (UBC); Omineca Mountains 3 (BCPM); Peace River district 1 (UBC); Pine River, Peace River district 1 (UBC); Quesnel 1 (UBC); 40 miles north of Revelstoke 1 (UBC); Salmon Arm 1 (UBC); Skagit Valley 1 (BCPM); Upper Skagit River, Lightning Lakes 3 (BSC); Stuart Lake 70 (BSC); Sustut River 1 (BSC); Sustut River 9 (BCPM); Table Lake 1 (BCPM); Tacla Lake 6 (BSC); Wells Gray Park 4 (UBC); Wisteria 1 (BCPM);

California: Attwell's Mill 1 (BSC); Big Creek, Mariposa Co. 2 (BSC); Cahto 1 (BSC); Cassell, Shasta Co. 2 (BSC); Covelo 1 (BSC); Fort Crock 1 (USNM); Shasta Co. 2 (USNM); Trinity Co. 1 (BSC); Wawona, Sierra Nevadas 1 (BSC); Yosemite Valley 1 (BSC);

Idaho: Sawtooth 1 (BSC);

Maine: Aroostook Co. 1 (USNM);

Manitoba: Cross Lake 2 (BSC); Nelson River 1 (USNM); Norway House 44 (UBC); Oxford House 2 (BSC);

Michigan: Marquette Co. 2 (UM); near Vermillion, Luce Co. 1 (UM);

Montana: no locality 1 (USNM);

New Brunswick: Trousers Lake 1 (AMNH);

New Hampshire: no locality 1 (AMNH); Monadnock 1 (BSC); Mount Deception, Coos Co. 1 (AMNH); Pittsburgh Village, Coos Co. 1 (AMNH);

New York: no locality 1 (AMNH); Adirondacks 10 (USNM); Altamont, Franklin Co. 1 (AMNH); Big Moose Lake 1 (USNM); Brownstract 1

(USNM); De Bar Mountain Game Refuge, Treadmill 1 (AMNH); Essex Co. 4 (USNM); Saranac Lake 1 (USNM); Severence 1 (BSC); near Stony Lake 1 (USNM);
Ontario: 35 miles NW Cochrane, Abitibi district 1 (BSC); Kapuskasing 2 (NMC);
Oregon: Glendale 1 (BSC);
Quebec: Eureka Lake, Pontiac Co. 2 (NMC); Godbout 4 (USNM); Godbout 8 (BSC); near Lake Edward 1 (NMC); Lake Mistassini 2 (NMC); Lake St. John 1 (USNM); NW of Laurentides Park 1 (NMC);
Saskatchewan: Red Earth 5 (UBC);
Washington: Glacier Creek, Hoh River 1 (BSC); Hoodspout 12 (BSC); Iron Creek 1 (BSC); Lake Cushman 4 (BSC); Skokomish River, Olympic Mountains 5 (BSC); Trout Lake, Mount Adams 24 (BSC).

B. Characters measured

Condylobasal length: distance from the most anterior point of the premaxilla to the midpoint of a line connecting the most posterior surfaces of the occipital condyles.

Upper tooth row: the least distance in a straight line from the anterior surface (at the alveolus) of the upper canine to the posterior surface of the inner lobe of the upper molar on the same side.

Mastoid width: the greatest width separating the outer surfaces of the mastoid processes.

Palate length: least anteroposterior length of palate, measured from the anterior surface of the suture of the two premaxillae to the posterior surface of the palate, on the zygus notch.

Canine width at base: width separating the outer sides of the upper canines, measured at alveoli.

Rostral width: greatest width of rostrum at the point of greatest constriction behind the canines.

Preorbital width: least width separating the outer surfaces of the preorbital concavities.

Postorbital width: least width separating the outer surfaces of the postorbital concavities.

Bulla length: greatest length of the Bulla, measured from the external carotid foramen to the hind surface of the jugular process.

Upper molar inner moiety length: greatest anteroposterior length of the inner lobe of the upper molar.

Upper molar width: greatest mesial-labial width of upper molar.

Waist of upper molar: the least anteroposterior width of the isthmus connecting the outer and inner lobes of the upper molar.

Palate width: taken at its narrowest point.

Length of last upper premolar: taken at its greatest extent.

C. Cranial measurements of the subspecies of fisher

Those statistics graphed on figure 2 are not included here since they may be calculated from the figure, if they are desired. Statistics given are mean, standard deviation, and sample size.

	<i>pennanti</i>			<i>intergrades</i>			<i>columbiana</i>			<i>pacifica</i>		
MALES												
Upper tooth row.....	4.36	.12	16	4.44	.11	7	4.44	.11	18	4.28	.09	20
Mastoid width.....	5.43	.21	21	5.56	.10	6	5.63	.17	19	5.41	.15	24
Canine width at base.....	2.21	.13	23	2.27	.07	17	2.30	.11	36	2.27	.08	26
Preorbital width.....	2.65	.11	16	2.63	.09	7	2.70	.12	18	2.67	.11	20
Postorbital width.....	1.91	.13	16	1.85	.15	7	1.94	.17	18	1.97	.14	20
Bulla length.....	2.19	.08	24	2.21	.06	15	2.22	.07	33	2.16	.09	26
Upper molar inner moiety length	.73	.04	25	.73	.03	16	.74	.04	36	.76	.04	26
Upper molar width.....	1.05	.04	24	1.07	.04	17	1.06	.05	36	1.07	.04	26
Waist of upper molar.....	.56	.03	25	.54	.02	17	.55	.04	36	.57	.03	26
Palate width.....	1.12	.07	23	1.14	.07	17	1.10	.06	36	1.11	.06	25
Length of last upper premolar.	1.19	.06	25	1.24	.03	16	1.23	.04	36	1.21	.03	26
FEMALES												
Upper tooth row.....	3.74	.05	5	3.78	.08	7	3.80	.11	7	3.85	.25	9
Mastoid width.....	4.43	.13	15	4.56	.06	3	4.62	.14	10	4.63	.18	9
Canine width at base.....	1.78	.09	19	1.86	.04	17	1.82	.05	35	1.85	.05	11
Preorbital width.....	2.31	.21	6	2.24	.08	7	2.23	.09	7	2.35	.12	6
Postorbital width.....	1.84	.03	5	1.93	.12	7	1.90	.08	7	1.89	.06	6
Bulla length.....	2.01	.08	19	2.02	.06	17	2.04	.08	34	1.97	.06	10
Upper molar inner moiety length	.61	.03	18	.60	.02	17	.59	.03	35	.63	.03	11
Upper molar width.....	.92	.03	18	.92	.04	17	.89	.02	35	.93	.04	11
Waist of upper molar.....	.46	.02	18	.47	.03	12	.46	.02	34	.48	.03	11
Palate width.....	1.01	.06	18	1.04	.02	12	1.03	.04	34	.99	.03	11
Length of last upper premolar.	1.05	.04	19	1.08	.03	12	1.07	.03	34	1.09	.04	11

REFERENCES

- ALLEN, J. A. 1898. Nomenclatorial notes on certain North American mammals. *Bull. Amer. Mus. nat. Hist.* 10:449-461.
- ANDERSON, R. M. 1946. Catalogue of Canadian recent mammals. *Bull. nat. Mus. Canada* 102.
- AUDUBON, J. J. and J. BACHMAN. 1845-1848. The viviparous quadrupeds of North America. New York, J. J. Audubon, 3 v.
- . 1851-1854. The quadrupeds of North America. New York, V. G. Audubon, 3 v.
- BACHRACH, M. 1946. *Fur...* New York, Prentice-Hall, 346 p.
- BAIRD, S. F. 1857. General report upon the mammals of the several Pacific railroad routes. *U.S. Pac. R.R. Expl. and Surv.*, 8, pt. 1.
- BUFFON, G. L., and L. J. M. D'AUBENTON. 1758 and 1765. *Histoire naturelle...* V. 7 and 13. Paris, Imprimerie Royale.
- COUES, E. 1877. *Fur-bearing animals...* U.S.D.I., Geol. Surv. Misc. Publ. 8.
- DEVOS, A. 1952. Ecology and management of fisher and marten in Ontario. *Tech. Bull. Ont. Dept. Lds For.*
- DICE, L. R., and H. J. LERAAS. 1936. A graphic method for comparing several sets of measurements. *Contr. Lab. Vertebr. Genet. Univ. Mich.* 3:1-3.
- ELLIOTT, D. G. 1901. A synopsis of the mammals of North America and the adjacent seas. *Publ. Field Col. Mus.* 2.
- ERXLEBEN, I. C. P. 1777. *Systema regni animalis...* Leipzig, Weygand, 48, 636.
- GOLDMAN, E. A. 1935. New American mustelids of the genera *Martes*, *Gulo*, and *Lutra*. *Proc. biol. Soc. Wash.* 48:175-186.
- GRAY, J. E. 1843. List of the specimens of Mammalia in the collection of the British Museum. London, *Brit. Mus. nat. Hist.* 3 v.
- GRINNELL, J. 1933. Review of the recent mammal fauna of California. *Univ. Calif. Publ. Zool.* 40:71-234.
- GRINNELL, J., J. DIXON, and J. M. LINSDALE. 1937. *Fur-bearing mammals of California...* Berkeley, Univ. Calif. Press, 2 v.
- HAGMEIER, E. M. 1958. Inapplicability of the subspecies concept to North American marten. *Syst. Zool.* 7:1-7.
- MILLER, G. S., Jr. 1899. Preliminary list of the mammals of New York. *Bull. N.Y. St. Mus.* 6:273-390.
- . 1924. List of North American recent mammals 1923. *Bull. U.S. nat. Mus.* 128.

- MILLER, G. S., Jr., and R. KELLOGG. 1955. List of North American recent mammals. Bull. U.S. nat. Mus. 205.
- MILLER, G. S., Jr., and J. A. G. REHN. 1901. Systematic results of the study of the N. A. land mammals to the year 1900. Proc. Boston Soc. nat. Hist. 30.
- PENNANT, T. 1771. Synopsis of quadrupeds. Chester, Monk.
- POOLE, A. J., and VIOLA S. SCHANTZ. 1942. Catalogue of the type specimens in the United States National Museum... . Bull. U.S. nat. Mus. 178.
- RAND, A. L. 1945. Mammal investigations on the Canol Road, Yukon and Northwest Territories. Bull. nat. Mus. Canada 99.
- RHOADS, S. N. 1894. A reprint of the North American Zoology, by George Ord... . Haddonfield, privately printed.
- . 1898. Contributions to a revision of the North American beavers, otters and fishers. Trans. Amer. phil. Soc., n.s. 19: 417-439.
- RICHARDSON, J. 1829. Fauna boreali-americana... . London, Murray.
- SCHINZ, H. B. 1845. Systematisches Verzeichniss... . Solothurn, Jent and Gassmann, 2 v.
- SETON, E. T. 1929. Lives of game animals... . New York, Doubleday Doran, 8 v.

Received for publication 6 June 1958

POSTGLACIAL DISPERSAL OF THE WESTERN CHORUS FROG IN EASTERN CANADA

SHERMAN BLEAKNEY

Division of Zoology, National Museum of Canada, Ottawa, Ontario

INTRODUCTION

CONTRARY to recent reports by Smith (1957) and Gibbs (1957), the Western Chorus Frog *Pseudacris nigrita triseriata* is widely distributed through eastern Ontario and southern Quebec. Because of the paucity of records from this area, the above authors have assumed that the species does not occur in the area and they have formulated their postglacial dispersal and speciation theories accordingly. New evidence presented in this paper places some doubts on their premise that *P. n. triseriata* or *P. n. feriarum* were ever distributed much further north than they extend today.

The Western Chorus Frog is a tiny terrestrial frog rarely seen except during its breeding season in early spring. Where it ranges into Ontario and Quebec this season extends through April and May with the peak in late April. At this time, the male choruses may be heard both day and night from temporary ponds and ditches. By means of auditory survey it is relatively easy to determine the presence or absence of the species in any area. The writer spent some weeks doing this in the springs of 1954 and 1955 and managed to determine the northeastern limit of this frog. As a result, the species range was extended 130 miles to the east of previous Canadian reports (Toner and St. Remy, 1941), thereby giving the Western Chorus Frog the unique distinction of ranging farther east than any of the eastern chorus frogs of the Atlantic coastal region.

SURVEY METHOD

The network of roadways in southern Quebec makes surveying by car ideal and it was literally possible to zig zag in and out of the species range. The survey method employed was to drive slowly with windows open and

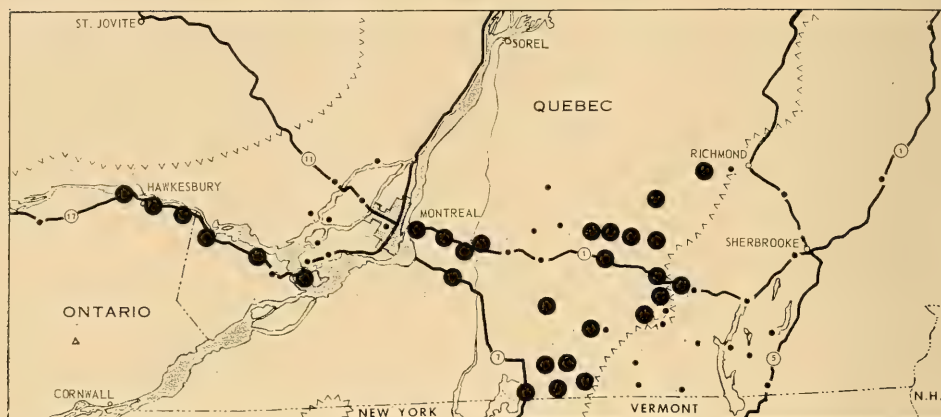


FIGURE 1. Distribution records of *Pseudacris nigrita triseriata* in eastern Ontario and southern Quebec. The open triangle and the large dots indicate locality records. The small dots are where the species was sought but not found.

record the sites at which choruses were heard. If after a few miles no choruses were evident then the car was stopped and the engine shut off. We then listened with cupped ears for choruses further back from the roadways. If none could be heard a new course was set until we re-entered the species range. Often a daylight survey course was retraced at night to check abundance and presence of other species and for purposes of collecting specimens. This frog is unique in its suitability to this type of survey. It is a cold-water breeder (the first anuran to appear in the spring), and the choruses do not cease on cold evenings as is the case with our other Canadian anurans. Another important factor is that it calls during the daylight hours, often in chorus, which is rare for other early spring breeding frogs. We found also that the choruses were invariably made up of many individuals even at the periphery of the range, where one might expect widely scattered choruses composed of only a few individuals. The call is an unmistakable rapid trill which can best be likened to the effect produced by running a finger along the teeth of a pocket comb.

Figure 1 is a summary of the records of *triseriata* from eastern Canada. The open triangle near Cornwall represents the only previous report from the area (Toner and St. Remy, 1941). The circles indicate all sites where observations or collections were made by myself and the large circles show where *triseriata* was recorded. The lines of V's mark the approximate location of the 800-foot contour in the St. Lawrence Valley.

FACTORS LIMITING DISPERSAL

There are at least three factors that limit the dispersal of the species in this area. One is the eastern barrier of the mountains represented by the 800-foot contour line. West of this is another barrier, the efficient system of drainage canals in the farm area along the south side of the St. Lawrence River. The land has been cleared, tilled and drained to a degree that no habitat suitable for *triseriata* could be found in the areas surveyed. The third formidable barrier is the Ottawa and St. Lawrence Rivers. For example, in the region of Montreal,

triseriata is found on the mainland only along the south shores of the Ottawa and St. Lawrence Rivers. It has been unable to cross the rivers except at Ile Perrot, an island located at the confluence of the Ottawa and St. Lawrence rivers. Here, *triseriata* has crossed a 1000-foot-wide stretch of river and gained the island. It is abundant there. However, only another 1000 feet of water separates this colony of frogs from Montreal Island. Ile Bizard and Ile Jésus, adjacent to Montreal Island on the north, are likewise without *triseriata*. On a quiet evening, at the west end of Montreal Island, one can hear the choruses of *triseriata* from across the river on Ile Perrot. As far as has been determined it is the only species of amphibian or reptile in the area that has not been successful in crossing the rivers. Such species as *Hyla c. crucifer*, *Hyla v. versicolor*, *Plethodon c. cinereus*, and *Storeria d. dekayi* have had no difficulty in traversing these waters and are common on both sides of the rivers and on the islands.

How these barriers function is a matter of speculation at present. However, low temperature is an unlikely limiting factor because *triseriata* is the first anuran to appear in spring. Most early spring-breeding amphibians range northward as far as their temperature tolerance limits will allow (Moore, 1939). *Rana sylvatica*, which appears in spring at the same time or shortly after *triseriata*, ranges to the arctic tree line. Other early breeders such as *Ambystoma jeffersonianum*, *A. maculatum*, *Bufo terrestris americanus*, and *Hyla c. crucifer* also range far to the north. A general rule in eastern Canada is that the earlier the species emerges from hibernation and starts breeding, the farther north it can be expected to range. *P. n. triseriata* on the other hand does not even extend as far north as *Rana catesbeiana*, which requires warm water and is the last frog to breed in summer (June and July).

My field observations indicate habitat specificity as the key to this situation, for *triseriata* prefers the grassy field habitat and is only found in such areas. Consequently it is confined to valleys and prairie-like formations, the limiting factor in mountainous areas being lack of suitable habitat, not cold temperature or altitude per se. In eastern Canada there seems to be a direct relation between the degree of slope and the presence or absence of *triseriata*. This explains its absence above an altitude of 800 feet in southeastern Quebec, where the terrain becomes steep, forested, rocky and stream-ridden. The closely related subspecies *P. n. septentrionalis* of the prairies is similar for it follows the grasslands far into the Northwest Territories but does not enter the Rocky Mountains even in the latitude of southern Alberta. Near Waterton National Park, at the Montana border, I have collected *septentrionalis* in the mixed field and forest habitat of the rolling foothills to the very base of the mountains at 5100 feet. However, within the mountain valleys at grassy stream-side ponds, I could not find it even at 4400 feet. In valleys of both the Rockies and Appalachians there are often grassy areas that appear suitable for *Pseudacris*, but this frog requires quiet water of temporary field ponds, ditches, and water holes in which to lay its eggs. Most temporary ponds in mountainous areas are adjacent to rivers (oxbow ponds, water-table ponds, and flood-fed ponds) and in early spring when *Pseudacris* requires these sites for its breeding congresses, these ponds are inundated by the raging torrents of the flooding rivers typical of the spring

runoff in mountainous areas. The quiet origin of meltwater ponds and ditches in rolling lowlands is in sharp contrast. Probably, then, it is altitude as related to availability of fields and breeding sites rather than altitude alone, that limits *Pseudacris* in mountainous areas.

Why it has difficulty crossing the large rivers is another problem, but certainly its habit of breeding in temporary ponds precludes the possibility of the tadpoles swimming away or being transported by river currents. Many so-called pond frogs that breed in the same habitat as *triseriata* also lay eggs in lakes and in quiet bays and weed beds along river banks and thus are subject to cross-river dispersal.

POSTGLACIAL DISPERSAL

The postglacial dispersal pattern of *triseriata* has been a subject of speculation by several authors. Schmidt (1938) first mentioned *triseriata* as a possible Prairie Peninsula representative, although he warned against its inclusion because of its more extensive range than that of the typical Prairie Peninsula relicts which are centered in the Illinois-Indiana-Ohio region. Schmidt's caution was well perceived for *triseriata* ranges through southern Ontario and Quebec and there are no disjunct populations over its range which typify relict species and areas. I feel that *triseriata* repopulated glaciated eastern North America early in postglacial time along with the other anurans which breed in cold water. It probably accompanied such species as *Rana sylvatica*, *Hyla crucifer* and *Ambystoma jeffersonianum* in recolonization as far as its habitat specificity allowed it. Had there been suitable grasslands in northern Quebec and Labrador it too would be found in the subarctic today, as is its western counterpart *septentrionalis*. Because *triseriata*'s eastern limit has not been known up to now, and because it is a grassland frog, the temptation to associate it with the Prairie Peninsula is a natural one. However, the nearest occurrence of true Prairie Peninsula species (Schmidt, 1938), is some 600 miles to the southwest of Quebec. As depicted by Smith (1957, fig. 38) in his excellent analysis of postglacial dispersal patterns, the greater part of *triseriata*'s range lies within the eastern forest formation. It does not seem reasonable to assume that it confined itself to the Prairie Peninsula habitat up to the end of the Xerothermic period (Deevey, 1949), at which time it suddenly spread hundreds of miles to the north and east into grassy habitats within the forest formation. It is mere coincidence that *triseriata* prefers a grassy habitat and that the Prairie Peninsula developed within the same geographic area.

Smith (1957) has postulated that *P. n. feriarum* of southeastern United States ranged all through the northeastern United States and southern Quebec and Ontario in pre-Prairie Peninsula times. It is his belief that during the Xerothermic period, which followed the Thermal Maximum, *P. n. triseriata* entered the area with the steppe formation and bisected *feriarum*'s range, interbreeding and swamping it so that only *triseriata* and a few *triseriata* $\times$ *feriarum* phenotypic populations now exist west of the Appalachians from Kentucky to New York State. He also postulates that during this period *triseriata* penetrated to the Atlantic coast and left a hybrid population (*P. n. kalmi* Harper) in New Jersey and the Del-Mar-Va peninsula. Subsequently all *Pseudacris* retreated from eastern Ontario, Quebec and the Appalachians, creating the distribution pattern as

plotted by Smith. He also speaks of an eastward extension of the grassland which "enabled the prairie *triseriata* to reach New Jersey." This is probably a reference to Schmidt's (1938) hypothetical Steppe Corridor through the Mohawk Valley of central New York. There is no evidence for such a corridor and it is Gleason's belief (1922, p. 72) that "extensive prairies were not developed east of Cleveland" nor in southern Ontario.

In the light of these observations, Smith's dispersal history of *triseriata* and *feriarum* seems implausible. It is evident that *triseriata* has not retreated from eastern Canada and eastern New York State. It has a continuous distribution (not a disjunct relict-type distribution) through eastern Ontario and southern Quebec to the base of the Appalachian Mountains and extends south from there along the shores of Lake Champlain at least to Plattsburg, New York (Gibbs, 1957). Therefore the entire area of the eastern Great Lakes and upper St. Lawrence Valley is even today suitable for *Pseudacris*, which occupies all available habitats. It is seemingly limited only by mountains and wide rivers and there is no evidence of any post-Xerothermic retreat. Reasoning that *triseriata* cannot advance, and certainly has not retreated from any suitable areas, then one must ask why *feriarum* retreated from north of the Ottawa River (Smith, 1957, fig. 39B) to New Jersey, a distance of 350 miles. A recent retreat of this distance is most unusual. Note that Smith's figures 10 to 16 (1957) depict typical disjunct distribution patterns and these isolated populations are separated from the main body of the species range by an average of only 168 miles. In fact if *feriarum* had ever ranged up the Hudson, Mohawk and Richelieu valleys, and considering that *triseriata* demonstrates even today the suitability of the climate some 300 miles north of New Jersey, one would at least expect relict populations of *feriarum* in the lowland triangle of the Albany-Johnstown-Glens Falls area of eastern New York State. However, Bishop (1923) collected there for years and never reported finding any *feriarum*. It is a cold-water breeder and emerges early in spring, so cooler environmental temperatures can hardly be the factor that prevents its northward dispersal through the Appalachians. It is probably as habitat-specific as *triseriata* and finds that mountainous terrain (including valleys in same) does not provide the correct kind of habitats in which to breed and feed. In this connection, Schwartz (1957) could not find any *Pseudacris* in the montane portions of South Carolina even though *feriarum* was common in the piedmont. In conclusion, it can be argued that *feriarum* and *triseriata* never ranged much farther in northeastern North America than they do today.

TAXONOMIC RELATIONSHIPS

There remains the problem of why the Ontario, Quebec and New Jersey populations seem to be intermediate in character between *feriarum* and *triseriata* as reported by Smith and Smith (1952). On the basis of the above arguments, I discard the possibility of previous contact and hybridization, as put forward by Smith (1957), and prefer his original suggestion (Smith and Smith, 1952) of peripheral variant populations. Such populations in *Diemictylus v. viridescens* and *Hyla c. crucifer* exist in eastern Canada where many of the former lack red spots (thus resembling *D. v. louisianensis*) and where the hylid shows

an increase in body length towards the northern limits of its range (Bleakney, unpublished data). In a species as plastic as *Pseudacris* peripheral varying populations are to be expected, especially if they are semi-isolated populations and therefore experience limited gene exchange with adjacent populations. Habitat specificity and associated isolation may play a part well *within* the species range, for, as Smith and Smith (1952) reported, although a series of *triseriata* from any one locality are usually remarkably homogeneous, a series from an adjacent area may differ considerably.

Recalling the apparent difficulty that *triseriata* is having in crossing the Ottawa and St. Lawrence rivers (also Strait of Mackinac in northern Michigan?) one can speculate that the Delaware and Susquehanna rivers must considerably slow the gene exchange between the New Jersey and Del-Mar-Va peninsular populations, and isolate these in turn from the main population in adjacent Pennsylvania and Virginia. In fact, it would not be surprising if measurements from hundreds of specimens proved the populations on Del-Mar-Va and on New Jersey to have measurable differences. Harper (1955) measured only 29 specimens from New Jersey, 12 from Pennsylvania and 5 from Virginia and described the new subspecies *kalmi*. The specimens measured were males previously selected for large size and conspicuous stripes. This sample is inadequate for such a plastic form, and it is not a random sample and therefore not of a real population. The analysis ignores the fact that two peninsulas are being dealt with and in addition the peninsula with the narrowest contact, and therefore more likely to show differences, is represented by only 5 specimens from its southernmost tip.

Gibbs (1957) recently collected four specimens of *Pseudacris nigrita* at Plattsburg, New York, about 20 miles south of the New York-Quebec border. The tibia/body ratios range from 44.5 percent to 48.8 percent, and Smith and Smith (1952) designated 47 percent as the division line between *triseriata* and *feriarum*. Gibbs follows Smith (1957) and suggests this population is a relict intergrade one of *triseriata* $\times$ *feriarum* and was once part of the main eastern Great Lakes population. This four-specimen sample is inadequate for determination of the relationships of this Plattsburg population and in any case the population is certainly still continuous with the eastern Great Lakes population of *triseriata*.

The only pertinent data available from Canadian material are from a population of *Pseudacris* at Ottawa, Ontario, and one at Philipsburg, Quebec, 130 miles east of Ottawa. The tibia/body ratio for 40 Ottawa specimens was 41.5 percent (range 37 to 45). (Males and females are considered together because although females are larger they are proportionately so and their *t/b* ratios are randomly scattered over the total range of male variation.) The Philipsburg sample of 33 specimens gave a ratio of 39.5 percent (range 36 to 44). Smith and Smith (1952) gave 42.5 percent as mean for *triseriata* and 50.6 percent for *feriarum* which places the Canadian populations near *triseriata*. The discrepancy between my figures and those of Smith and Smith is probably due to those workers having measured preserved specimens whereas my data were taken from freshly killed specimens. There is some differential shrinkage even when the animal is carefully preserved. In my specimens after three years

preservation the body shortened and/or arched 1-3 millimeters whereas the tibia shrank only 0-1 millimeter. A differential shrinkage of 2 millimeters would mean that a fresh specimen having a t/b ratio of 42.8 percent could have a ratio of 46.1 percent after preservation.

Smith and Harper place great emphasis on the mean value of relative leg lengths, and rightly so (Schmidt, 1938), but they have overlooked the factor of differences in the mean value of absolute lengths. The two populations examined in Canada (Ottawa and Philipsburg) exhibited a slight difference in relative tibial length, being 39.5 percent at Philipsburg and 41.5 percent at Ottawa. The implication is that Philipsburg *Pseudacris* have shorter tibias than Ottawa ones. This is not so in the absolute sense for the mean length of tibia (because of sexual dimorphism only males are considered in these absolute measurements) of the Philipsburg specimens is 11.2 mm (range 10-13) whereas Ottawa specimens have a mean of 9.9 mm (range 8-12). The respective mean body lengths for the males are 28.2 mm (range 25-33 mm) for Philipsburg and 24.1 mm (range 20-28 mm) for Ottawa. The Philipsburg *Pseudacris* are, then, larger than Ottawa *Pseudacris* in all respects but do have relatively shorter legs. It is, then, the absolute not the relative measurements which best distinguish these two populations.

There are also pigmentary differences between these two samples. The dorsal stripes on many of the Ottawa specimens are rather narrow (a *feriarum* character) and have quite regular margins. The stripes have a narrow dark border, and usually there is a row of dark stipples between the dark dorsal stripes. Most of the Philipsburg specimens, on the other hand, have very broad stripes (a *triseriata* character) with irregular borders, not dark margined, and the mid-dorsal stripe may be entirely absent or represented only by widely separated sections (a *feriarum* character). The ventrum of these Philipsburg specimens has considerable dark mottling. The taxonomic allocation of these two Canadian populations by Fowler's Table I (1955) is difficult. The Ottawa specimens are considerably smaller than his typical *triseriata* which have a body about 27.2 mm long and a tibia 11.5 mm. The Philipsburg males have his average *kalmi* body lengths, about 28.0 mm, but their tibia lengths are *triseriata*. Actually there is a greater degree of difference between the body and tibia lengths of the Ottawa and Philipsburg specimens than there is between Harper's (1955) *kalmi* and *feriarum*. Lacking more extensive collections from southern Canada, these populations must be considered as variants of *triseriata*, whose plastic nature has already been emphasized by Smith and Smith (1952).

It might be argued that the robust nature of the Philipsburg *Pseudacris* indicates affinity with *kalmi*, but I prefer another explanation in keeping with my above hypothesis that there never was an exchange of *Pseudacris* across the Appalachians. Recalling the effectiveness of large rivers as a barrier to dispersal of *triseriata*, I feel that there has been so little gene exchange between *triseriata* populations on the north and south sides of Lake Erie, Lake Ontario and the St. Lawrence River that the Ontario *triseriata* and the New York-Quebec *triseriata* have evolved in comparative isolation from each other and express this isolation in slight measurable differences such as the Ottawa and Philipsburg samples demonstrate. The species probably entered Ontario from Michigan

in the Lake St. Clair region. This Ontario entrance gate was the one utilized by *Bufo woodhousei fowleri*, *Acris gryllus crepitans*, *Natrix septemvittata*, *Thamnophis butleri*, *Heterodon platyrhinos platyrhinos*, *Coluber constrictor flaviventris*, *Elaphe vulpina gloydi* (which even occurs on the Ontario side of the St. Lawrence River but not in northern New York State) and probably *Sistrurus catenatus catenatus* as indicated by their present distribution patterns. Many other amphibians and reptiles may have had the same dispersal history but having migrated along both the north and south shores of the Great Lakes and St. Lawrence River their present continuous distribution does not indicate their long genetic semi-isolation. This can only be revealed by analysis of populations from the two dispersal avenues.

SUMMARY

The recent discovery that *P. n. triseriata* occurs in eastern Ontario and southern Quebec calls for a new interpretation of its postglacial dispersal. Smith (1957) assumed that the species had retreated from the area since the Xerothermic period and formulated his dispersal hypothesis accordingly.

A detailed survey of this species was conducted in southern Quebec and its range was found to be sharply delineated. The chief barrier to the dispersal are wide rivers and mountains and this has a basis in its habitat specificity. The frog seems to be limited to grassy habitats and breeds only in temporary bodies of water. The chances of cross-river dispersal by either tadpole or adult are thus remote. The chief limiting factor in mountainous country is probably lack of suitable breeding ponds at the correct time of year. The frog requires quiet water in spring when the snow is melting. Pools in grassy mountain valleys at this time of year are usually inundated by raging river overflow, typical of spring runoff in mountainous terrain.

On the basis of its present distribution and ecology, it is doubtful whether the species was ever closely associated with the Prairie Peninsula or ever crossed the Appalachian Mountains to New Jersey. It probably repopulated southern Canada early in postglacial times, along with other cold water breeders, and has altered its range very little since that time. By the same token, Smith's (1957) proposal that *feriarum* once ranged over the Appalachian Mountains into central Canada is untenable.

There is ample evidence that *Pseudacris nigrita* is a very plastic species and the allocation of the name *kalmi* to the New Jersey peripheral population is not justified. Two Canadian populations of *triseriata* from opposite sides of the St. Lawrence River show a greater degree of difference than do *kalmi* and *feriarum*. This is attributed to the long semi-isolation of the Ontario and the New York-Quebec populations from one another by the intervening barrier of Lake Ontario and the St. Lawrence River.

REFERENCES

- BISHOP, S. C. 1923. Notes on the herpetology of Albany County, New York. II. *Copeia* (120): 83-84.
- DEEVEY, E. S. 1949. Biogeography of the Pleistocene. *Bull. geol. Soc. Amer.* 60: 1315-1415.
- GIBBS, R. H. Jr. 1957. The chorus frog *Pseudacris nigrita* at Plattsburg, New York. *Copeia* (4): 311-312.
- GLEASON, H. A. 1922. The vegetational history of the Middle West. *Ann. Ass. Amer. Geogr.* 12: 39-85.

- HARPER, FRANCIS. 1955. A new chorus frog (*Pseudacris*) from the eastern United States. *Nat. Hist. Mis.* (150): 1-6.
- MOORE, J. A. 1939. Temperature tolerance and rates of development in the eggs of amphibia. *Ecology* 20: 459-578.
- SCHMIDT, K. P. 1938. Herpetological evidence for the postglacial eastward extension of the steppe in North America. *Ecology* 19: 396-407.
- . 1938b. A geographic variation gradient in frogs. *Zool. Ser. Field Mus. nat. Hist.* 20: 377-382.
- SMITH, P. W., and D. M. SMITH. 1952. The relationship of the chorus frogs *Pseudacris nigrata feriarum* and *Pseudacris n. triseriata*. *Amer. Midl. Nat.* 48: 165-180.
- SMITH, P. W. 1957. An analysis of post-Wisconsin biogeography of the Prairie Peninsula region based on distributional phenomena among terrestrial vertebrate populations. *Ecology* 38: 205-218.
- TONER, G. C., and N. DE ST. REMY. 1941. Amphibians of eastern Ontario. *Copeia* (1): 10-13.

Received for publication 18 July 1958

NOTE

Picoides arcticus Nesting in the Cariboo, British Columbia

ON MAY 28, 1958, I was working near Phililoo Lake, about five miles west of Lac la Hache, in the Cariboo region of British Columbia. A repetitive, high-pitched calling caught my attention and suggested that the nest of some woodpecker was nearby. Some fifty yards away the nesting hole was discovered, about ten feet up in a living Douglas Fir *Pseudotsuga menziesii* tree. Shortly afterwards a female Black-backed Three-toed Woodpecker *Picoides arcticus* was seen to alight upon the tree trunk, on the side opposite to the hole and about a foot below it, and to approach the hole by a counterclockwise spiral path. At least three young birds appeared in the entrance and the female fed them.

Another visit was made on May 30, a cold rainy day. The same noise was heard as before, but it was the male bird that appeared in the entrance calling. The female approached, by the identical path used previously, and fed the male. It is possible that the adverse weather necessitated brooding the young and the male also acted as intermediary in feeding them.

A third visit was made to the nest on June 18. No birds were then found in the nest and it was assumed that the

young had fledged successfully. It was noticed that a lot of bark had been removed along the course of the approach path previously described, quite probably from its repeated use. Somewhat similar removal of bark around nesting sites of this species has been described by Kempkes (*Murrelet* 27:26-27, 1946) and by Roberts (*The Birds of Minnesota*, v.1, 1932; cited in Bent, "Life Histories of North American Woodpecker," *Bull. U.S. nat. Mus.* 174, 1939). The latter author suggested that this might aid the bird in identification of its nesting tree. Similar approach paths have been described by England (*Condor* 42:242-245, 1940), but with no mention of any scarring of the bark.

This apparently is the first published record of this species breeding in the Cariboo region, as well as the first published record of its presence there in summer. However, mention should be made of a nest of *Picoides arcticus* found at Doctor's Lake, about 10 miles south of Williams Lake, in 1954, by Miss Mary Jackson (personal communication), which predates this record.

ANTHONY J. ERSKINE

Department of Zoology
University of British Columbia
Vancouver 8, British Columbia
8 October 1958

INDEX TO VOLUME 73

Compiled by JOHN M. GILLET and LESLIE JENKINS

- Abies balsamea*, 157, 158; *lasiocarpa*, 22
Acanthis, 80; *flammea*, 92; *flammea flammea*, 112; *hornemanni exilipes*, 112
Accipiter, 42; *gentilis*, 13
Achillea lanulosa, 156-159, 164, 166
Achnanthes affinis, 139; *austriaca*, 139; *calcar*, 139; *flexella*, 139; *kryophila* var. *dense-striata*, 139; *lanceolata*, 140; *lapponica*, 140; *linearis*, 140; *linearis* var. *pusilla*, 140; *minutissima*, 140; *minutissima* var. *cryptocephala*, 140; *obliqua*, 140; *Suchlandtii*, 140.
Acris gryllus crepitans, 204
Actinastrium gracillimum, 138
Actitis macularia, 10, 88
Adventive plants at Churchill, Manitoba, by Eva Beckett, 169
Aechmophorus occidentalis, 7, 85
Agelaius phoeniceus, 92
Agropyron, 163; *repens*, 158, 159, 171; *trachycaulum*, 165, 171; *trachycaulum* var. *glaucum*, 164, 165; *trachycaulum* var. *novae-angliae*, 159, 164, 165
Agrostis alba, 156, 159; *scabra*, 164, 165, 171; *stolonifera* var. *compacta*, 171
Aix sponsa, 86
Alaska, Notes on the phytoplankton of Karluk Lake, Kodiak Island, by Douglas K. Hilliard, 135
Alca torda, 20
Alces alces, 22, 25; *americana*, 98
Alcock, F. J.
 Review of: *Geology of the Great Lakes*, 58
Alectoria, 23
Algae, the Grass of Many Waters, reviewed by Elwyn O. Hughes, 55
Alnus, 83
Alopecurus aequalis, 163; *pratensis*, 158, 159
Amanita muscaria, 130
Amaranthus retroflexus, 171
Ambystoma jeffersonianum, 199, 200; *maculatum*, 199
Aniurus, 181
Ammonoids, Revision of some Triassic, British Columbia, by Frank H. McLearn, 53
Amphora ovalis, 140; *ovalis* var. *pediculus*, 140; *perpusilla*, 140
Anacystis, 137; *incerta*, 139; *montana* f. *minor*, 139; *nidulans*, 139; *thermalis* f. *major*, 139
Anaphalis margaritacea var. *intercedens*, 159
Anas acuta, 5, 70, 86, 105; *carolinensis*, 70, 86, 105; *platyrhynchos*, 1, 8, 86, 105; *rubripes*, 2
Anemone canadensis, 171; *multifida*, 166
Animal Tracks and Hunter Signs, reviewed by Austin W. Cameron, 61
Ankistrodesmus falcatus, 137, 138; *falcatus* var. *mirabilis*, 138
Anomoenoeis exilis, 140
Anser albifrons frontalis, 100; *brachyrhynchus*, 122
Antennaria ekmaniana, 169; *parvifolia*, 164; *subviscosa*, 166
Anthoxanthum odoratum, 159
Anthus spinoletta, 90; *spinoletta rubescens*, 80, 111
Apodontia rufa, 52
Aquila chrysaetos, 87, 106, 177
Arctium minus, 159
Arctostaphylos rubra, 98, 169; *uva-ursi*, 83, 164, 166, 167
Ardea herodias, 7, 85
Arenaria (Aves) *interpres morinella*, 76, 108
Arenaria lateriflora, 159
Arnica, 98
Arnold, John W.
 Observations on birds of the Mackenzie King estate, Kingsmere, Quebec, 115
Arnold, Ruth Horner
 Review of: *Tales from the Vienna Woods*, 133
Artemiopsis stefanssoni, 82
Artemisia biennis, 173; *herriotii*, 173; *ludoviciana* var. *gnaphalodes*, 173
Asio flammeus, 88, 111; *otus*, 174
Aster ciliolatus, 164; *junciformis*, 164, 166; *novi-belgii*, 157-159; *pansus*, 164, 166
Asterionella formosa, 137, 140
Astragalus goniatus, 164, 166
Atkinson, Reginald N.
 Bobolink nesting at Penticton, British Columbia, 129
Auk, Great, Notes on the, in Nova Scotia, by Earl W. Godfrey, 175
Avena fatua, 171
Axyris amaranthoides, 171
Aythya affinis, 86; *americana*, 86; *collaris*, 4, 86; *marila*, 8, 86; *valisineria*, 86
Baffin Island, Notes on the birds of southern Foxe Peninsula, by Ian A. McLaren, 63.
Baione, 181

- Banfield, A. W. F.
 Review of: The Mammals of Banks Island, 57
- Barbarea orthoceras*, 172; *vulgaris*, 172
- Beckett, Eva
 Adventive plants at Churchill, Manitoba, 169
- Beckmannia syzigachne*, 164, 165, 167
- Beetles as parasites of mammals, by Walter Sheppe, 52
- Bendell, James F.
 Bony shells of musk turtles in nest of Bald Eagle, 131
- Betula glandulosa*, 22, 92, 93, 161; *payrifera*, 22
- Biological Research in Conservation — A Symposium, reviewed by V. E. F. Solman, 178
- Birds, notes on, of southern Foxe Peninsula, Baffin Island, by Ian A. McLaren, 63
- Birds of Alaska, The, reviewed by W. Earl Godfrey, 180
- Birds of Alberta, reviewed by David A. Munro, 132
- Birds of the Anderson River and Liverpool Bay, Northwest Territories, by E. Otto Höhn, 93
- Birds of Maryland and the District of Columbia, reviewed by David A. Munro, 57
- Birds of the Mackenzie King Estate, Kingsmere, Quebec, by John W. Arnold, 115
- Birds of Kleena Kleene, British Columbia, by W. Adrian B. Paul, 83
- Bittern, American, 85
- Blackbird, Brewer's, 12, 42, 44, 46, 47, 92; Red-winged, 30, 35, 36, 39, 41, 44-47, 92; Rusty, 35, 41, 112, 113; Yellow-headed, 92
- Bleakney, Sherman
 Postglacial dispersal of the Western Chorus Frog in Eastern Canada, 197
- Review of: Variation and Systematic Relationships within the Salamander Genus *Taricha*, 60
- Bluebird, Mountain, 90
- Bobolink nesting at Penticton, B.C., by Reginald N. Atkinson, 129
- Bobwhite, 38
- Bombycilla cedrorum*, 12, 90; *garrula*, 90
- Bonasa umbellus*, 10, 87
- Boothia Isthmus, Additional plant records from Spence Bay, by D. B. O. Savile, 168
- Boreogadus saida*, 67, 79
- Botaurus lentiginosus*, 85
- Boyer, George F.
 Hand-reared Mallard releases in the Maritime Provinces, 1
- Brant, 69; Black, 104
- Branta bernicla hrota*, 69; *bernicla nigricans*, 104; *canadensis*, 8, 86, 104; *canadensis butchinsii*, 68; *canadensis interior*, 67, 68; *occidentalis*, 86
- Brassica campestris*, 172; *juncea*, 172; *kaber* var. *pinnatifida*, 172; *oleracea* var. *botrytis*, 148
- Braya purpurascens*, 169
- British Columbia, A summer record of the Great Gray Owl in southern, by James Grant, 173
- British Columbia, Bird observations at Tahsis Inlet, Vancouver Island, by George J. Mitchell, 6
- British Columbia, Bobolink nesting at Penticton, by Reginald N. Atkinson, 129
- British Columbia, Migrations of caribou in Wells Gray Park, by R. Yorke Edwards and Ralph W. Ritcey, 21
- British Columbia, *Picoides arcticus* nesting in the Cariboo, by Anthony J. Erskine, 205
- British Columbia, Records of marine fishes in, by Don E. McAllister, 13
- British Columbia, Review of some Triassic ammonoids, by Frank H. McLearn, 53
- British Columbia, The birds of Kleena Kleene, by W. Adrian B. Paul, 83
- Bromus inermis*, 171
- Bryant, Joseph E.
 Magpie specimen from Wrigley, N.W.T., 177
- Bubo virginianus*, 88, 173
- Bucephala albeola*, 9, 87, 131; *clangula*, 8, 86; *islandica*, 86, 131
- Bufflehead, 9, 29, 35, 36, 41, 43-47, 87
- Bufo terrestris americanus*, 199; *woodhousei fowleri*, 204
- Bulbochaete*, 138
- Bunting, Indigo, 115; Snow, 29-46, 81, 93, 112
- Bushitit, Common, 44, 47
- Buteo lagopus jobannis*, 73, 106
- Butomus umbellatus*, 53
- Bylot Island, Northwest Territories, The breeding biology of the Greater Snow Goose, by Louis Lemieux, 117
- Cabezón, 14
- Calamagrostis*, 161, 165; *canadensis*, 167; *inexpansa*, 167; *inexpansa* var. *brevior*, 163, 164, 166; *neglecta*, 163, 164, 165, 167
- Calcarius lapponicus lapponicus*, 80, 112; *pictus*, 112
- Calder, J. A.
 Review of: Spring flowers of the Lower Columbia River, 57

- Caloneis bacillum*, 140; *Schumanniana* var. *biconstricta*, 140; *silicula* var. *tumida*, 140
 Cameron, Austin W.
 Review of: Animal Tracks and Hunter Signs, 61
 Review of: The Ghost of North America—The Story of the Eastern Panther, 133
 Review of: The Mammals of North America, 179.
Campanula rotundifolia, 159
Campylodiscus noricus var. *hibernica*, 140
Canachites canadensis franklinii, 87
 Canvasback, 34, 35, 37, 41, 43, 45-47, 86
Capella gallinago, 88; *gallinago delicata*, 108
Capsella bursa-pastoris, 158, 159, 170, 172
Cardamine parviflora var. *arenicola*, 159, 160
 Cardinal, 34-38, 40
Carex aquatilis, 163; *atherodes*, 163, 164, 165; *aurea*, 164; *maritima*, 168; *nardina*, 168; *nigra*, 159; *pratensis*, 166; *rupestris*, 168; *scirpoides*, 168; *silicea*, 157, 159; *subspatheacea*, 168; *ursina*, 168
 Caribou, Migrations of, in British Columbia, by R. Yorke Edwards and Ralph W. Ritcey, 21
Carpodacus cassinii, 92
Carum carvi, 158, 159
Cassiope tetragona, 97, 119
Castilleja, 98; *raupii*, 164, 166
Castor canadensis, 52
 Catbird, 35, 115
Catharacta skua, 19; *skua antarctica*, 19; *skua chilensis*, 19
 Century of Biological Research, A., reviewed by V. E. F. Solman, 134
Cepphus grylle, 20; *grylle ultimis*, 54, 78
Cerastium vulgatum, 158, 159
Ceratum, 137; *hirundinella*, 139
Ceratoneis arcus, 140; *arcus* var. *amphioxys*, 140; *arcus* var. *linearis*, 140
Chamaecyparis nootkatensis, 6
 Chan, A. P.
 Review of: Symbolism in Flower Arrangement, 59
 Changes in the Fauna of Ontario, reviewed by W. Earl Godfrey, 132
Charadrius semi-palmatus, 75, 108; *vociferus*, 88
Chen caerulescens, 126; *caerulescens caerulescens*, 69; *caerulescens hyperborea*, 69, 101; *hyperborea*, 86; *hyperborea atlantica*, 117; *hyperborea hyperborea*, 101, 117, 122; *hyperborea nivalis*, 101; *rossi*, 103
Chenopodium album, 157, 159, 171; *capitatum*, 171; *gigantospermum*, 171; *glaucum*, 171; *leptophyllum*, 171
 Chickadee, Black-capped, 29-46, 90, 115; Boreal, 29-31, 37, 40, 43; Chestnut-backed, 11, 44, 46, 47; Mountain, 45, 46, 90
Chlamydomonas pseudopertyi, 139
Chlidonias niger, 88
Chlorantrum stentorinum, 138
Chordeiles minor, 88
 Christmas Bird Census—1958, edited by W. Earl Godfrey, 29
Chroococcus limneticus, 139; *minutus*, 139
Chrysomela aeneicollis, Elytral pattern distribution in, by Walter Robert Henson, 26
Cicuta maculata, 164, 167
Cinclus mexicanus, 11, 90
Circus cyaneus, 87; *cyaneus hudsonius*, 107
Cirsium arvense, 158, 159, 173; *vulgare*, 157, 159
Citellus parryi, 106
 Cladonia, 22
Clangula hyemalis, 70, 105
Clastidium setigerum, 139
Climacoptus acuticeps, 14
Closterium, 138
 Clovers and other legumes. Some inflorescence forms in, by William G. Dore, 147
Clupea harengus, 13; *harengus pallasi*, 13; *pallasi*, 13
Cocconeis pediculus, 140; *placentalis*, 140
Coelastrum cambricum, 138; *microsporum*, 138
Coelopleurum lucidum, 159
Coelosphaerium Kuetzingianum, 139
Collomia linearis, 172
Colaptes cafer, 11, 89
Coluber constrictor flaviventris, 204
Columba fasciata, 10, 88
Colymbus auritus, 7; *grisegena*, 7
 Comparative Biosystematics and Life History of the Nuthatches *Sitta pygmaea* and *Sitta pusilla*, reviewed by Louise de Kiriline Lawrence, 56
Conringia orientalis, 172
 Conservation Papers (The Royal Bank of Canada), reviewed by V. E. F. Solman, 134
Contopus sordidulus, 89
Convolutulus sepium forma coloratus, 159
 Coot, American, 10, 35, 44-47, 48
 Cormorant, 45; Brandt, 7, 43, 44; Double-crested, 17, 44, 45, 47; Great, 30; Pelagic, 7, 43-46
Corvus brachyrhynchos, 89; *caurinus*, 11; *corax*, 11, 89; *corax principalis*, 80, 111
Cosmarium, 137; *botrytis* var. *paxillosporum*, 138; *norimbergense* var. *Boldtii*, 138; *phaseolus* var. *alaskana*, 138; *pyramidatum*, 138; *subrenatum*, 138

- Cottontail, History of, in Manitoba, by Stuart Criddle, 177
- Cottus asper*, 182; *punctulatus*, 182; *ricei*, 182
- Couesius plumbeus*, 181
- Cowbird, 29-32, 35, 36, 41, 92, 115
- Crane, Little Brown, 108; Sandhill, 88; Whooping, 108
- Creeping Brown, 32, 34-44, 46, 47, 115
- Criddle, Stuart
- History of the cottontail in Manitoba, 177
- Crocethia alba*, 109
- Crossbill, Red, 29, 34, 47; White-winged, 29, 31-33, 36, 43
- Crow, American, 115; Common, 29-36, 38-44, 46, 89; Northwestern, 11, 44, 46, 47
- Crucigenia fenestrata*, 138; *rectangularis*, 138
- Cuckoo, Black-billed, 115
- Curlew, Eskimo, 108
- Cyanocitta stelleri*, 11, 89
- Cyclops scutifer*, 142
- Cyclotella bodanica*, 137, 140; *bodanica* var. *lemanensis*, 140; *comensis*, 140; *comta*, 140; *Meneghiniana*, 140; *ocellata*, 140; *pseudostelligera*, 140; *stelligera*, 140
- Cymatogaster aggregata*, 14
- Cymbella aequalis*, 140; *affinis*, 140; *cistula*, 140; *cistula* var. *maculata*, 140; *Clericii*, 140; *cymbiformis*, 140; *gracilis*, 140; *lanceolata*, 140; *microcephala*, 140; *prostrata*, 140; *prostrata* var. *robust*, 140; *sinuata*, 140; *tumida*, 140; *tumidula*, 140; *turgida*, 140; *ventricosa*, 140; *ventricosa* var. *silesiaca*, 140
- Cymbellonitzschia diluviana*, 140
- Cynanchum medium*, 144, 145, 146; *nigrum*, 144, 145, 146; *vincetoxicum*, 144, 145, 146
- Cypseloides niger*, 88
- Cyrtolepturites magnificus*, 53
- Cystopteris fragilis*, 168
- Danthonia spicata*, 156, 159
- Delphinapterus leucas*, 110
- Dendragapus obscurus*, 87
- Dendrocopos pubescens*, 13, 89; *villosus*, 11, 89
- Dendroica auduboni*, 91; *coronata*, 91; *petechia*, 91, 112
- Descampsia flexuosa*, 156, 159
- Descurainia sophia*, 172; *sophioides*, 172
- Diatoma elongatum*, 140; *hiemale* var. *mesodon*, 140; *vulgare* var. *grandis*, 140; *vulgare* var. *producta*, 140
- Dictyosphaerium Eberenbergianum*, 138; *pulchellum*, 137, 138
- Didymosphenia geminata*, 140
- Diemictylus viridescens louisianensis*, 201; *viridescens viridescens*, 201
- Dinobryon*, 137; *bavaricum*, 139; *social* var. *americanum*, 139
- Diphyllobotrium ursi*, 135
- Diploneis elliptica*, 140; *ovalis*, 140; *Smithii*, 140
- Diplotriaena tricuspis*, 130
- Dipper, 11, 90; American, 45, 46
- Dogfish, Spiny, 13
- Dog-strangling vine, chromosome number and occurrence in Canada, by Raymond J. Moore, 144
- Dolichonyx oryzivorus*, 129
- Dore, William G.
- Some inflorescence forms in clovers and other legumes, 147
- Dove, Mourning, 35, 37, 38, 40, 41, 45, 46, 88, 115; Rock, 29-35, 37-40, 43, 44, 46, 47
- Dovekie, 20, 29, 30
- Draba lactea*, 169
- Dracocephalum parviflorum*, 172
- Dryas integrifolia*, 97
- Dryocopus pileatus*, 89
- Dryopteris filix-mas*, 157, 158; *phlegopteris*, 157, 158; *spinulosa*, 157, 158
- Duck, 29, 86, 113; Black, 29-32, 34-39, 41; Greater Scaup, 8; Harlequin, 9, 35, 41, 43-45, 47, 87; Ring-necked, 35, 46, 47, 86; Ruddy, 43, 45, 47, 87; Wood, 32, 45, 47, 86
- Dunlin, 44, 45, 47, 76
- Eagle, Bald, 10, 29-31, 34, 36-38, 41, 43-45, 47, 87, 107; Golden, 43, 45, 46, 87, 106, 113
- Eagle, Bald, Bony shells of musk turtles in nest of, by James F. Bendell, 131
- Eagle, Golden, Nesting of, at Sugluk Inlet, Ungava, Quebec, by Walter R. Spofford, 177
- Ectoparasites of the Cottontail Rabbit in Lee County, Northern Illinois, reviewed by J. Frank McAlpine, 132
- Edwards, R. Yorke, and Ralph W. Ritcey
- Migrations of caribou in a mountainous area in Wells Gray Park, British Columbia, 21
- Eider, Common, 17, 29, 30, 70, 105; King, 35, 72, 106
- Elaphe vulpina gloydi*, 204
- Elymus mollis*, 157, 159; *mollis* ssp. *villosissimus*, 168
- Elytral pattern distribution in adjacent populations of *Chrysomela aeneicollis*, by Walter Robert Henson, 26
- Empetrum*, 157; *nigrum*, 98, 156, 157, 159
- Entosphenus japonicus*, 182
- Epilobium angustifolium*, 164; *glandulosum* var. *adenocaulon*, 164; *latifolium*, 98; *palustre* var. *oliganthum*, 163

- Epithemia sorex*, 140; *turgida*, 140; *turgida* var. *granulata*, 140; *zebra* var. *saxonica*, 140
- Eremophila alpestris*, 89; *alpestris alpestris*, 79; *alpestris boyti*, 111
- Ereuntes pusillus*, 13, 76, 109
- Erigeron lonchophyllus*, 165, 167
- Erolia alpina*, 76; *bairdii*, 76, 108; *fuscicollis*, 76, 108; *maritima*, 76; *melanotos*, 108; *minutilla*, 76, 109
- Erskine, Anthony J.
A joint clutch of Barrow's Goldeneyes and Bufflehead eggs, 131
- Picoides arcticus* nesting in the Cariboo, British Columbia, 205
- Erucastrum gallicum*, 172
- Erysimum cheiranthoides*, 169, 172
- Euphagus carolinus*, 112; *cyancephalus*, 12, 92
- Euphrasia americana*, 159; *randii*, 156, 159
- Eupithecia stellata*, 129
- Euroglena volvox*, 139
- Falco columbarius bendirei*, 107; *peregrinus anatum*, 74, 107; *rusticolus*, 107; *rusticolus obsoletus*, 74; *sparverius*, 87
- Falcon, Peregrine, 44, 45, 47, 74, 107; Prairie, 43
- Festuca brachyphylla*, 168; *rubra*, 156-158; *rubra* var. *juncea*, 158
- Finch, Cassin's, 46, 92; House, 44-47; Purple, 29-42, 44, 46, 47, 116; Rosy, 45, 92
- Fisher, A re-evaluation of the subspecies of, by Edwin M. Hagmeier, 185
- Flagelaria crotonensis*, 137
- Flicker, Red-shafted, 11, 44-47, 89; Yellow-shafted, 29, 31, 33, 35, 37, 38, 41, 42, 45, 115
- Flook, Donald R.
An occurrence of lodgepole pine in the Mackenzie District, 130
- Flounder, Starry, 14
- Flowering rush in Nova Scotia, by Ivan Victor Hall, 53
- Flycatcher, Crested, 115; Least, 115
- Fox, the Gray, A Manitoba record, by Richard W. Sutton, 54
- Fragaria*, 158; *vesca* var. *americana*, 157, 159; *virginiana*, 157, 159; *virginiana* var. *terranovae*, 164, 166
- Fragilaria bidens* f. *major*, 140; *brevistriata*, 140; *capucina*, 140; *capucina* var. *mesolepta*, 140; *construens*, 140; *construens* var. *biceps*, 140; *construens* var. *binodis*, 140; *construens* var. *venter*, 140; *crotonensis*, 140; *leptostauron*, 140; *pinnata*, 140; *pinnata* var. *lancettula*, 140; *Vaucheriae*, 140; *Vaucheriae* var. *capitellata*, 140; *viridescens*, 140
- Fratricula arctica*, 20
- Freshwater Fishes of Canada, The, reviewed by D. E. McAllister, 181
- Frog, Western chorus, postglacial dispersal, in eastern Canada, by Sherman Bleakney, 197
- Frog, Western chorus, Spring emergence of, by Stanley W. Gorham, 176
- Fulica americana*, 10, 88
- Fulmar, 15, 67
- Fulmarus glacialis*, 15; *glacialis minor*, 67
- Fungus, A poisonous, in the Northwest Territories, by John P. Kelsall, 130
- Gadwall, 47
- Galium septentrionale*, 164, 166, 173; *trifidum*, 163
- Gannet, 17
- Gavia adamsii*, 66, 99, 180; *arctica*, 180; *arctica pacifica*, 66, 100; *immer*, 7, 66, 85, 99; *stellata*, 66, 100
- General Biology, reviewed by H. H. J. Nesbitt, 182
- Gentiana amarella*, 164-167
- Geology of the Great Lakes, reviewed by F. J. Alcock, 58
- Geothlypis trichas*, 92
- Geum macrophyllum* var. *perincisum*, 163, 164
- Gloeocystis gigas*, 138
- Glyceria pulchella*, 163
- Godfrey, W. Earl, Christmas Bird Census—1958, 29
- Notes on the Great Auk in Nova Scotia, 175
- The Common Scoter on Cape Breton Island, Nova Scotia—a correction, 184
- Review of: Changes in the Fauna of Ontario, 132
- Review of: The Birds of Alaska, 180
- Godwit, Hudsonian, 109
- Goldeneye, 46; Barrow's, 32, 44-46, 86; Common, 8, 29-32, 34-47, 86
- Goldeye, Barrow's and Bufflehead eggs, A joint clutch of, by Anthony J. Erskine, 131
- Goldfinch, American, 13, 30-32, 34-42, 45, 46, 116
- Gomphonema acuminatum* var. *coronata*, 140; *angustatum*, 140; *angustatum* var. *sarcophagus*, 140; *constrictum*, 140; *constrictum* var. *capitata*, 140; *erriense*, 141; *gracile*, 141; *herculeanum*, 141; *herculeanum* var. *clavatum*, 141; *herculeanum* var. *robustum*, 141; *herculeanum* var. *sepiaceus*, 141; *intricatum* var. *pumila*, 141; *olivaceoides*, 141; *olivaceum*, 141; *parvulum*, 141; *ventricosum*, 141

- Gomphospheria lacustris*, 139
Gonatozygon Kinahani, 138
Gonionotites, 53
Gonium pectoral, 139
 Goose, Blue, 69; Canada, 8, 29, 30, 34, 37, 45, 47, 86, 104, 113; Hutchins', 68; Lesser Snow, 45, 69; Ross's, 103; Snow, 44, 86, 100; Todd's Canada, 67; White-fronted, 100, 113
 Goose, Greater Snow, The breeding biology of, on Bylot Island, by Louis Lemieux, 117
 Gorham, Stanley W.
 Spring emergence of the western chorus frog, 176
 Goshawk, 13, 38, 41-43, 45, 46, 113
 Grackle, Common, 29-32, 35-37, 40
 Grant, James
 A summer record of the Great Gray Owl in southern British Columbia, 173
 Hummingbirds attacked by wasps, 174
 Wing-clapping display of the Long-eared Owl, 174
 Grassland vegetation near Fort Providence, Northwest Territories, by John W. Thieret, 161
 Grebe, Eared, 44-46, 85; Horned, 7, 29, 30, 35, 41, 43-46, 85; Pied-billed, 45, 46, 85; Red-necked, 7, 29, 30, 43-46, 85; Western, 7, 43-46, 85
Griesbachites, 53
 Grosbeak, Evening, 29-44, 46, 47; Pine, 29, 31-34, 36-40, 42, 43, 45, 46, 92, 113; Rose-breasted, 115
 Grouse, Blue, 46, 87; Ruffed, 10, 29, 31-46, 87, 115; Sharp-tailed, 42, 43, 88; Spruce, 45, 87
Grus americana, 108; *canadensis*, 88; *canadensis canadensis*, 108
Guembelites, 53
 Guide to Saskatchewan Mammals, A, reviewed by Austin W. Cameron, 60
 Guide to the Aging of Pheasant Embryos, A, reviewed by David A. Munroe, 58
 Guillemot, Black, 20, 78; Pigeon, 44, 45, 47
 Guillemot, Mandt's Black, Breeding on the Hudson Bay coast of Ontario, by H. G. Lumsden, 54
 Gull, Black-headed, 29, 30; Bonaparte's, 19, 44, 45, 88, 115; California, 45, 47, 110; Glaucous, 10, 29, 30, 35, 36, 39-41, 77, 110, 113; Glaucous-winged, 10, 43-45, 47; Great Black-backed, 19, 29-31, 34-36, 39, 41; Herring, 19, 29-32, 34-37, 39-41, 44-47, 77, 88, 110; Iceland, 29, 30; Kumlien's, 77; Mew, 43-45, 47, 110, 113; Ring-billed, 29, 30, 34-36, 39-41, 47; Sabine's, 77, 110; Short-billed, 13, 113; Slaty-backed, 110; Thayer's, 110
 Gyrfalcon, 74, 107
Gyrosigma attenuatum, 141
 Hagmeier, Edwin M.
 A re-evaluation of the subspecies of Fisher, 185
Haliaeetus leucocephalus, 10, 87, 107, 131
 Hall, Ivan Victor
 Flowering rush in Nova Scotia, 53
Halorites, 53
Hantzschia amphioxys, 141
 Hawk, Broad-winged, 115; Cooper's, 33-39, 41, 44-47; Marsh, 35-38, 41, 43-45, 87, 107, 113; Pigeon, 30, 33, 35, 38, 41-47, 107, 113; Red-shouldered, 37, 38, 41, 115; Red-tailed, 30, 34-41, 43-45, 47; Rough-legged, 30-32, 35-37, 41, 44-46, 73, 106; Sharp-shinned, 29-31, 37, 38, 40-47; Sparrow, 32, 34-41, 44-47, 87
Hedysarum mackenzii f. *mackenzii*, 151; *mackenzii* forma **proliferum**, 151, 154
Helianthus annuus f. *lenticularis*, 173
 Hellebore poisoning, A case of, by J. Edward Underhill, 128
 Henson, Walter Robert
 Elytral pattern distribution in adjacent populations of *Chrysomela aeneicollis*, 26
Heracleum maximum, 157, 159, 172
Heraclites exquiritus, 53
 Heron, Great Blue, 7, 37, 41, 44-47, 85
 Herring, 13
Heterodon platyrhinos platyrhinos, 204
Hieracium aurantiacum, 159; *floribundum*, 159; *pilosella*, 159; *umbellatum*, 165; *odorata*, 164
 Hilliard, Douglas K.
 Notes on the phytoplankton of Karluk Lake, Kodiak Island, Alaska, 135
Hirundo rustica, 11
Histrionicus histrionicus, 9, 87
 Höhn, E. Otto, Birds of the mouth of the Anderson River and Liverpool Bay, Northwest Territories, 93
Hordeum jubatum, 164-166, 171
 Hughes, Elwyn O.
 Review of: *Algae, the Grass of Many Waters*, 55
 Hummingbirds attacked by wasps, by James Grant, 174
 Hummingbird, Ruby-throated, 115; Rufous, 10, 88
Hyla crucifer, 200; *crucifer crucifer*, 199, 201; *versicolor versicolor*, 199
Hyalobryon mucicola, 139; *polymorphum*, 143
Hylocichla fuscescens, 90; *guttata*, 90

- Ictalur*, 182
Icterus bullockii, 92
Indoclonites, 53
 Inflorescence forms in clovers and other legumes, Some, by William G. Dore, 147
 Investigations of Ring-Necked Pheasants in Illinois, reviewed by E. W. Taylor, 58
Iridoprocne bicolor, 89
Iva xanthifolia, 173
Ixoreus naevius, 12, 90
- Jaeger Long-tailed, 77, 109; Parasitic, 18, 77, 109; Pomarine, 77, 109
 Jay, Blue, 29-43, 115; Canada, 113; Gray, 29, 30, 36, 37, 40, 42-44, 89; Steller's, 11, 44-47, 89
 Johansen, Frits, 1882-1957, by A. E. Porsild and E. L. Bousfield, 82
 Judd, William W.
 Nematode worms, *Diplotrinaena tricuspis* (Fedt.), from the body cavity of a Nashville Warbler at London, Ontario, 130
Junco hyemalis, 12, 92; *oreganus*, 12, 92
 Junco, Oregon, 12, 34, 40-47, 92; Slate-colored, 12 29-42, 44, 46, 92
Juncus bufonius, 158, 159; *tenuis*, 159
Juniperus, 157; *communis* var. *saxatilis*, 156, 158; *horizontalis*, 156, 157, 158
Juvavites caurinus, 53; *clavatus*, 53; *humii*, 53; *sekwyni*, 53
- Kelsall, John P.
 A poisonous fungus in the Northwest Territories, 130
 Killdeer, 37, 44-47 88
 Kingbird, Eastern, 89
 Kingfisher, 36; Belted, 11, 35, 37, 39-42, 44-47, 88
 Kinglet, Eastern Ruby-crowned, 21; Golden-crowned, 29, 31, 34-41, 43-47, 90; Ruby-crowned 35, 41, 44, 46, 47, 90
 Kittiwake, Black-legged, 77
 Krivda, Walter
 The pug moth *Eupithecia stellata* Hlst. at The Pas, Manitoba, 129
- Lactuca pulchella*, 170, 173
Lagopus lagopus, 88; *lagopus albus*, 107; *leucurus*, 88; *mutus*, 88; *mutus rupestris*, 75, 107
Lampetra ayresii, 181; *fluviatilis*, 181
 Lanceley, William Henry, 1893-1958, by Hoyes Lloyd 183
Lanius excubitor, 91
Lappula echinata, 172
- Lark, Horned, 30, 31, 35, 38, 43, 46, 79, 89, 111
Larus argentatus, 19, 88, 110; *argentatus smithsonianus*, 77; *argentatus vegae*, 110; *californicus*, 110; *canus* 13; *canus brachyrhynchus*, 110; *glaucescens*, 10; *glaucoides kumlieni*, 77, 110; *hyperboreus*, 10; *hyperboreus barrovianus*, 110; *hyperboreus hyperboreus*, 77; *marinus*, 19; *nelsoni*, 110; *philadelphia*, 19, 88; *schistisagus*, 110; *thayeri*, 110
Lathyrus palustris var. *pilosus*, 172
 Lawrence, Louise de Kiriline
 Review of: Comparative Biosystematics and Life History of the Nuthatches *Sitta pygmaea* and *Sitta pusilla*, 56
 Lead Poisoning as a Mortality Factor in Waterfowl Populations, reviewed by V. E. F. Solman 182
Ledum palustre, 98
 Lemieux, Louis
 The breeding biology of the Greater Snow Goose on Bylot Island, North-west Territories, 117
Lemmus trimucronatus phaioccephalus, 57
Leontodon autumnalis, 159
Lepidium densiflorum, 171; *ramosissimum*, 172
Leptinillus aplodontiae, 52; *validus*, 52
Leptinus americanus, 52
Leptocottus armatus, 14
Lepus arcticus banksicola, 57
Leucosticte tephrocotis, 92
Ligusticum scoticum, 157, 159
Limosa haemastica, 109
Linaria vulgaris, 158, 159, 170, 173
 Lloyd, Hoyes
 William Henry Lanceley, 1893-1958, 183
Lobipes lobatus, 18, 77, 109
 Lodgepole pine in the Mackenzie District, by Donald R. Flook, 130
Lolium persicum, 171
Lomatogonium rotatum, 164-167
 Longspur, Lapland, 31, 35, 36, 80, 112; Smith's, 112
 Loon, 44, 45, 113; Arctic, 43-46, 66, 100, 113; Common, 7, 29-31, 43-46, 66, 85, 99, 113; Red-throated, 44-46, 66, 100; Yellow-billed, 66, 99
Lophodytes cucullatus, 10, 87
 Lumsden, H. G.
 Mandt's Black Guillemot breeding on the Hudson Bay coast of Ontario, 54
Lupinus, 98
Lucula multiflora, 159
Lychnis alba, 171; *apetala*, 97; *triflora*, 168

- Lyngbya Diguetii*, 139; *purpurea*, 139
Lysichitum americanum, 128
- Mackenzie District, An occurrence of lodge-pole pine in the, by Donald R. Flook, 130
- Maggie, Black-billed, 42, 43, 45, 46, 89
- Maggie specimen from Wrigley, N.W.T., by Joseph E. Bryant, 177
- Maianthemum canadense*, 157, 159
- Malayites*, 53; *bococki*, 53; *custi*, 53; *parcus*, 53
- Mallard, 8, 29, 30, 32, 35-37, 39, 41-47, 86, 105, 113
- Mallard, Hand-reared, releases in the Maritime Provinces, by George F. Boyer, 1
- Mallomonas* spp., 137; *acaroides* var. *crassiquama*, 143; *caudata*, 139; *gracillima*, 139; *producta*, 139; *elongata*, 143; *pseudocoronata*, 143
- Mammals, Beetles as parasites of, by Walter Sheppe, 52
- Mammals of Banks Island, The, reviewed by A. W. F. Banfield, 57
- Mammals of North America, The, reviewed by Austin W. Cameron, 179
- Manitoba, Adventive plants at Churchill, by Eva Beckett, 169
- Manitoba, History of the cottontail in, by Stuart Criddle, 177
- Manitoba, The gray fox in, by Richard W. Sutton, 54
- Manitoba, The pug moth at The Pas, by Walter Krivda, 129
- Mareca americana*, 8, 86, 105
- Martes pennanti*, 185; *pennanti columbiana*, 185, 187; *pennanti pacifica*, 185, 187; *pennanti pennanti*, 185, 187
- Martin, Purple, 115
- Matricaria matricarioides*, 158, 159, 173
- McAllister, Don E.
 Records of marine fishes from fresh water in British Columbia, 13
 Review of: The Freshwater Fishes of Canada, 181
- McAlpine, J. Frank
 Review of: Ectoparasites of the Cottontail Rabbit in Lee County, Northern Illinois, 132
- McLaren, Ian A.
 Notes on the birds of southern Foxe Peninsula, Baffin Island, Northwest Territories, 63
- McLearn, Frank H.
 Revision of some Triassic ammonoids, Peace River foothills, British Columbia, 53
- Meadowlark, Eastern, 35, 38; Western, 44, 46, 47, 92
- Medicago sativa* L. forma **prolifera**, 150, 154
- Megacerycle alcyon*, 11, 88
- Melanitta deglandi*, 9, 73, 106; *perspicillata*, 9, 87, 106, 184
- Melilotus alba*, 172; *alba* Desr. forma **prolifera**, 151, 154; *officinalis*, 172
- Melosira arenaria*, 141; *distanis*, 141; *distanis* var. *lirata*, 141; *italica*, 141; *varians*, 141
- Melospiza melodia*, 12, 93
- Mentha arvensis* var. *villosa*, 163, 164
- Merganser, Common, 9, 29, 30, 32, 34-39, 41, 42, 44-47, 87; Hooded, 10, 32, 34, 35, 37, 43, 45-47, 87; Red-breasted, 10, 29-31, 35, 39, 41, 43-45, 47, 73, 106, 113
- Mergus merganser*, 9, 87; *serrator*, 10, 86, 106; *serrator serrator*, 73
- Meridion circulare*, 141
- Merismopedia glauca*, 139; *punctata*, 139; *thermalis*, 139
- Mertensia paniculata*, 170, 172
- Micractinium pussillum* var. *elegans*, 138
- Micropalama himantopus*, 109
- Microspora stagnorum*, 139
- Mitchell, George J.
 Bird observations at Tahsis Inlet, Vancouver Island, British Columbia, 6
- Mockingbird, 30
- Molothrus ater*, 92
- Monolepis nuttalliana*, 171
- Morone, 181
- Monotis subcircularis*, 53
- Moore, Raymond J.
 The Dog-strangling vine *Cynanchum medium*, its chromosome number and its occurrence in Canada, 144
- Morus bassanus*, 17, 175
- Mougeotia*, 139
- Muhlenbergia*, 163; *richardsonia*, 165
- Munro, David A.
 Review of: A Guide to the Aging of Pheasant Embryos, 58
 Review of: Birds of Maryland and the District of Columbia, 57
 Review of: The Birds of Alberta, 132
- Murre, Common, 20, 44, 45, 47; Thick-billed, 29, 78
- Murrelet, Ancient, 45; Marbled, 43-45, 47
- Musk Turtles, Bony shells of, in nest of Bald Eagle, by James F. Bendell, 131
- Mya truncata*, 73
- Myadestes townsendi*, 90
- Mynah, Crested, 46

- Natrix septemvittata*, 204
Navicula cocconeiformis, 141; *cryptocephala*, 141; *cryptocephala* var. *intermedia*, 141; *cryptocephala* var. *veneta*, 141; *cuspidata*, 141; *disjuncta*, 141; *farta*, 141; *hungarica* var. *luneburgensis*, 141; *lanceolata*, 141; *meniscus*, 141; *peregrina* var. *meniscus*, 141; *pseudoscutiformis*, 141; *pupula* var. *rectangularis*, 141; *radiosa*, 141; *Reinhardtii* var. *gracilior*, 141; *Reinhardtii* var. *striolata*, 141; *Schonfeldii*, 141; *semen*, 141; *vulpina*, 141
Nematode worms, *Diplotriana tricuspid* (Fedt.), from the body cavity of a Nashville Warbler at London, Ontario, by William W. Judd, 130
Nesbitt, H. H. J.
 Review of: General Biology, 182
Nighthawk, 88
Nitzschia acicularis var. *major*, 141; *angustata*, 141; *fonticola*, 141; *frustulum*, 141; *frustulum* var. *perpusilla*, 141; *gracilis*, 141; *palea*, 141; *sigmoidea*, 141
Northwest Territories, A poisonous fungus in the, by John P. Kelsall, 130
Northwest Territories, Birds of the Anderson River and Liverpool Bay, by E. Otto Höhn, 93
Northwest Territories, Grassland vegetation near Fort Providence, by John W. Thieret, 161
Northwest Territories, Magpie specimen from Wrigley, by Joseph E. Bryant, 177
Nova Scotia, Contributions to the flora of. VI. Notes on the vegetation of the Bird Islands, by E. Chalmers Smith and Wilfred B. Schofield, 155
Nova Scotia, Flowering rush in, by Ivan Victor Hall, 53
Nova Scotia, Golden Plover in, by Robie W. Tufts, 175
Nova Scotia, Notes on the Great Auk in, by Earl W. Godfrey, 175
Nova Scotia, Observations on marine birds off, by David M. Scott, 15
Nucifraga columbiana, 89
Numenius phaeopus hudsonicus, 108; *borealis*, 108
Nutcracker, Clark's, 45, 89
Nuthatch, Pygmy, 45, 46; Red-breasted, 29, 31-47, 90; White-breasted, 29, 31-43, 45, 115
Nyctea scandiaca, 79, 111
Nyroca affinis, 105; *marila*, 105
Oceanodroma leucorhoa, 17
Odocoileus hemionus, 22, 25
Oedogonium, 138
Oenanthe oenanthe leucorhoa, 80
Oenothera biennis, 159
Oideima nigra, 9; *nigra americana*, 184
Oldsquaw, 29-31, 35, 39, 41, 43-45, 47, 70, 105
Olor buccinator, 8, 85; *columbianus*, 67, 85, 100
Oncorhynchus nerka, 181
Ondatra zibethica, 98
Ontario, Mandt's Black Guillemot breeding on the Hudson Bay coast of, by H. G. Lumsden, 54
Opephora Martyi, 141
Oporornis tolmiei, 12, 91
Oriole, Bullock's, 92
Oscillatoria, 137
Oscillatoria rubescens, 139; *sancta*, 139; *tenuis*, 139
Osprey, 87
Ottawa Field Naturalists' Club, Financial statement, 1958, 51; Report of Council, 80th annual meeting, 47
Ovenbird, 115
Owl, 43; Barn, 45; Barred, 33, 39, 115; Boreal, 40; Great Gray, 45; Great Horned, 35-38, 41-43, 88; Hawk, 33, 88; Horned, 45; Long-eared, 35-37, 39, 41; Saw-whet, 37, 41, 44; Screech, 35-38, 41; Short-eared, 33, 36, 38, 39, 41, 44-46, 47, 88, 111, 113; Snowy, 33, 35, 36, 39, 41-43, 46, 79, 111
Owl, Great Gray, A summer record in southern B.C., by James Grant, 173
Owl, Long-eared, Wing-clapping display of, by James Grant, 174
Oxytropis maydelliana, 123
Oxyura jamaicensis, 87
Oystercatcher, Black, 47
Pandion haliaetus, 87
Panicum boreale, 159
Papaver, 97
Partridge, Gray, 29-31, 33-36, 38-40, 42, 43, 45, 46
Parus atricapillus, 90; *gambeli*, 90; *rufescens*, 11
Passer domesticus, 12, 92
Passerculus sandwichensis alaudinus, 112; *sandwichensis anthinus*, 112; *sandwichensis savanna* 112
Passerella iliaca, 12, 112
Paul, W. Adrian B.
 The Birds of Kleena Kleene, Chilcotin District, British Columbia, 1947-1958, 83
Pediastrum Boryanum, 138; *Boryanum* var. *brevicorne*, 138; *Boryanum* var. *longicorne*, 138; *Boryanum* var. *undulatum*, 138; *duplex*, 138; *duplex* var. *clathratum*, 138

- Pedicularis*, 97
Pedioecetes phasionellus, 88
Pelecanus erythrorhynchos, 85, 100
 Pelican, White, 85, 100
Perca flavescens, 182
Peridinium, 137; *aciculiferum*, 139; *volzii*, 139; *willei*, 139
Perisoreus canadensis, 89
Petasites sagittatus, 163, 165
 Petrel, Leach's, 17
Petrochelidon pyrrhonota, 89, 111
 Pewee, Eastern Wood, 115; Western, 89
Phalacrocorax auritus, 17; *pelagicus*, 7; *penicillatus*, 7
 Phalarope, Northern, 18, 77, 109; Red, 17, 76, 109
Phalaropus fulicarius, 17, 76, 109
Picoides arcticus nesting in the Cariboo, British Columbia, by Anthony J. Erskine, 205
Piranga ludoviciana, 92
 Plant records from Spence Bay, Boothia Isthmus, Additional, by D. B. O. Savile, 168
Plantago juncoideus var. *decipiens*, 157, 159; *major*, 157-159, 173
Platichthys stellatus, 14
Platypsyllus castoris, 52
Plautus alle, 20
Plectrophenax nivalis, 93, 112; *nivalis nivalis*, 81
Plethodon cinereus cinereus, 199
Pleurotaenium, 138
 Plover, American Golden, 75; Black-bellied, 47, 75, 108; Golden, 108; Semipalmated, 75, 108
 Plover, Golden, in Nova Scotia, by Robie W. Tufts, 175
Pluvialis dominica dominica, 75, 108, 175
Poa alpina, 158, 160; *annua*, 158; *glauca*, 168; *palustris*, 157; 158; *pratensis*, 156, 157, 158, 164, 171; *trivialis*, 158
 Pheasant, Ring-necked, 30, 32, 34-47
Pbleum pratense, 158, 159, 171
 Phoebe, Eastern, 115; Say's, 111
 Phytoplankton of Karluk Lake, Alaska, Notes on, by Douglas K. Hilliard, 135
Pica pica, 89, 177
Picea, 83; *engelmanni*, 22; *glauca*, 157, 158; *sitchensis*, 6
 Pigeon, Band-tailed, 10, 47, 88
Pinguinus impennis, 175
Pinicola enucleator, 92
 Pintail, 29, 38, 43-47, 70, 86, 105
Pinnularia appendiculata, 141; *gibba*, 141; *microstauron*, 141; *streptoraphe*, 141; *viridis*, 141
Pinus contorta, 22, 83, 84, 131; *monticola*, 6
Pipilo erythrophthalmus, 12
 Pipit, Water, 80, 90, 111
Podiceps auritus, 85; *caspicus*, 85; *griseigena*, 85
Podilymbus podiceps, 85
Polemonium, 97
Polygonum, 124; *amphibium* var. *stipula-ceum*, 163, 164; *aviculare*, 158, 159, 171; *cilinode*, 157, 159; *convolvulus*, 171; *lappathifolium*, 171; *ramosissimum*, 164, 167; *viviparum*, 123
Populus tremuloides, 22, 83, 161; *trichocarpa*, 83
 Porsild, A. E. and E. L. Bousfield, Frits Johansen 1882-1957, 82
Potamogeton, 136
Potentilla, 157; *arguta*, 164; *norvegica*, 158, 159, 172; *palustris*, 163; *pennsylvanica*, 164, 166; *tridentata*, 156, 158, 159
Primula incana, 164
Prunus virginiana, 157, 159
Pseudacris nigrita feriarum, 197, 200, 201, 202, 203, 204; *nigrita kahni*, 200, 202, 203, 204; *nigrita septentrionalis*, 199, 200; *nigrita triseriata*, 176, 197, 198, 199, 200, 201, 202, 203, 204
Pseudosirenites, 53
Pseudotsuga menziesii, 22, 83; *taxifolia*, 6
 Ptarmigan, Rock, 75, 88, 107; White-tailed, 88; Willow, 88, 107
Pterotoceras, 53
Puccinellia bruggemannii, 168
 Puffin, Common, 20
Puffinus gravis, 16; *griseus*, 16
 Pug moth, *Eupithecia stellata* Hlstr., at The Pas, Manitoba, by Walter Krivda, 129
Quadrigula lacustris, 138
 Quail, California, 44-47
 Quebec, Observations on birds of the Mackenzie King Estate, Kingsmere, by John W. Arnold, 115
Rana catesbeiana, 199; *sylvatica*, 199, 200
Rangifer arcticus, 21, 25
Ranunculus acris, 159; *gmelinii* var. *hookeri*, 163; *repens*, 159
Raphanus raphanistrum, 158, 159
 Raven, 89, 113; Common, 11, 29-32, 36, 37, 40, 44-47, 111; Northern, 80
 Razorbill, 20
 Redhead, 35, 41, 45, 46
 Redpoll, 80, 113; Common, 29, 32-34, 36-45, 46, 92, 112; Hoary, 112
 Redstart, American, 92, 115
Regulus calendula, 90; *satrapa*, 90

- Rhinanthus crista-galli*, 159, 164, 165, 167;
crista-galli var. *fallax*, 159
Rhizosolenia longiseta, 141
Rhoicosphenia curvata, 141
Ribes lacustre, 157, 159; *oxycanthoides*, 166, 167
Riparia riparia, 89, 111
Rissa tridactyla tridactyla, 77
 Robin, 90, 111, 113; American, 11, 29-31, 33-36, 38-42, 44, 45-47, 115
Roccus, 181
Rorippa islandica var. *fernaldiana*, 163, 167
Rosa acicularis, 164, 166, 167; 172
Rubus, 157; *arcticus*, 164; *idaeus* var. *aculeatissimus*, 172; *idaeus* var. *strigosus*, 157, 159
Rumex, 157; *acetosella*, 157-159; *crispus*, 158, 159; *fueginus*, 163, 167; *mexicanus*, 171; *occidentalis*, 163, 164; *orbiculatus*, 157, 159
Sagina procumbens, 159
Salix, 6, 22, 83, 119, 161
Salmo gairdneri, 181; *salar*, 181
Salpinctes obsoletus, 111
Salpingoeca frequentissima, 137, 139
Salsola kali var. *tenuifolia*, 171
Salvelinus, 181; *alpinus*, 182
Sambucus pubens, 159
 Sanderling, 30, 44, 45, 109
 Sandpiper, Baird's, 76, 108; Buff-breasted, 109; Least, 76, 109; Pectoral, 108; Purple, 29, 47, 76; Semipalmated, 13, 76, 109; Spotted, 10, 88; Stilt, 109; White-rumped, 76, 108
Saponaria vaccaria, 171
 Sapsucker, Red-breasted, 11, 89; Red-naped, 89; Yellow-bellied, 38, 45, 47, 115
 Savile, D. B. O.
 Additional plant records from Spence Bay, Boothia Isthmus, 168
Saxifraga foliolosa, 169; *hirculus*, 97; *rivularis*, 169
Sayornis saya, 111
 Scaup, Greater, 29, 30, 32, 35, 37, 38, 41, 43-47, 86, 105; Lesser, 35, 41, 45-47, 86
Scenedesmus, 137; *armatus* var. *major*, 138; *bijuga*, 138; *dimorphus*, 138; *ecornis*, 138; *helveticus*, 138; *obliquus*, 138; *opoliensis*, 138; *quadrecauda* var. *longispina*, 138; *quadrispinus*, 138; *Westii*, 138
Scirpus americanus, 117
Scolobloa festucacea, 163, 164
 Scoter, American, 184; Common, 9, 29, 43-45, 47; Surf, 9, 43-45, 47, 87, 106, 184; White-winged, 9, 29, 30, 35, 43-45, 47, 73, 106
 Scoter, The Common, on Cape Breton Island, a correction, by W. Earl Godfrey, 184
 Scott, David M.
 Observations on marine birds off south-western Nova Scotia, 15
 Sculpin, Sharpnosed, 14
Scutellaria galericulata var. *epilobiifolia*, 163
Selasphorus rufus, 10, 88, 174
Senecio jacobaea, 159; *lugens*, 98; *pauperculus*, 165, 166; *vulgaris*, 157, 159
Setaria viridis, 171
Setophaga ruticilla, 92
 Shearwater, Greater, 16; Sooty, 16
Shepherdia canadensis, 83, 164, 166, 167
 Sheppe, Walter
 Beetles as parasites of mammals, 52
 Shiner, Yellow, 14
 Shoveler, 45, 47
 Shrike, Loggerhead, 38; Northern, 29, 33-41, 43-47, 91, 113
Sialia currucoides, 90
Silene noctiflora, 171
Sirenites pardoneti, 53
 Siskin, Pine, 30, 32-41, 44-47
Sistrurus catenatus catenatus, 204
Sisymbrium altissimum, 172; *loeselii*, 172
Sisyrinchium montanum, 166; *montanum* var. *crebrum*, 159
Sitta canadensis, 90; *pusilla*, 56; *pygmaea*, 56
Sium suave, 163, 164
 Skua, 19
 Skylark, 47
 Snipe, Common, 30, 31, 35, 44-47, 108; Wilson's, 88
Smilacina stellata, 157, 159, 166
 Smith, E. Chalmers and Wilfred B. Schofield
 Contributions to the flora of Nova Scotia.
 VI. Notes on the vegetation of the Bird Islands, 155
Soiurus noveboracensis, 91
Solanum triflorum, 172
Solidago lepida var. *elongata*, 165, 166
Solidago sempervirens, 157, 159
 Solitaire, Townsend's, 45, 46, 90
 Solman, V. E. F.
 Review of: A Century of Biological Research, 134
 Review of: Biological Research in Conservation—A Symposium, 178
 Review of: Conservation Papers (The Royal Bank of Canada) 134
 Review of: Lead Poisoning as a Mortality Factor in Waterfowl Populations, 182
Somateria mollissima, 17; *mollissima borealis*, 70, 72; *mollissima v-nigra*, 105; *spectabilis*, 72, 106
Sonchus arvensis, 159; *arvensis* var. *glabrescens*, 173
Sorex, 52; *obscurus*, 52; *vagrans*, 52

- Sparrow, Chipping, 37, 92, 116; Field, 35, 38, 41; Fox, 12, 30, 43, 44, 46, 47, 112, 113; Golden-crowned, 12, 46, 47, 93; Harris', 46; House, 12, 29-47, 92, 115; Savannah, 40, 44, 112, 113; Song, 12, 29-31, 33-42, 44-47, 93, 115; Swamp, 29, 35, 37, 38, 40, 41; Tree, 29-43, 46, 112; White-crowned, 12, 34, 38, 44, 46, 47, 80, 92, 112, 113; White-throated, 30, 31, 34, 35, 38, 41, 80, 116
- Spatula clypeata*, 86
- Spence Bay, Additional plant records from, by D. B. O. Savile, 168
- Spergularia rubra*, 158, 159
- Sphaerocystis Schroeteri*, 137, 138
- Sphaeroeca volvox*, 139
- Sphyrapicus varius nuchalis*, 89; *varius ruber*, 11, 89
- Spinus tristis*, 13
- Spirogyra*, 139
- Spirulina*, 139
- Spizella arborea*, 112; *passerina*, 92
- Spofford, Walter R.
Nesting of the Golden Eagle at Sugluk Inlet, Ungava, Quebec, 177
- Spondylium planum*, 138; *planum* var. *alaskanum*, 138
- Spring Flowers of the Lower Columbia River, reviewed by J. A. Calder, 57
- Squalus acanthias*, 13
- Squatarola squatarola*, 75, 108
- Stachys palustris* var. *nipigonensis*, 164
- Starling, 29-44, 46, 47, 115; European, 91
- Staurastrum*, 137; *alternans*, 138; *granulosum*, 138; *lunatum* var. *planctonicum*, 138; *mucronatum* var. *subtriangulare*, 138; *pendulum* var. *pinguiforme*, 138; *petsamoense* var. *minus* f. *karlukense*, 138; *sebaldi* var. *impar*, 138
- Staurodesmus*, 137; *cuspidatus* f. *alaskanus*, 138; *dejectus*, 138
- Stauroneis anceps*, 141; *phoenicenteron*, 141
- Stelgidopteryx ruficollis*, 89
- Stellaria*, 97, 98; *crassifolia*, 169; *graminea*, 158, 159; *longipes*, 164, 166; *media*, 158, 159, 171
- Stephanodiscus astraera* var. *intermedia*, 141; *astraera* var. *minutula*, 141; *niagarae*, 141; *niagarae* var. *magnifica*, 141; *niagarae* var. *magnifica* f. *minor*, 141
- Stercorarius longicaudus*, 77, 109; *parasiticus*, 18, 77, 109; *pomarinus*, 77, 109
- Sterna dougallii*, 19; *hirundo*, 19; *paradisaea*, 19, 77, 111
- Sternotherus odoratus*, 131
- Strikinoceras*, 53
- Storeria dekayi dekayi*, 199
- Strix nebulosa*, 173
- Sturnella neglecta*, 92
- Sturnus vulgaris*, 91
- Styrites ireneanus*, 53
- Sugluk Inlet, Nesting of the Golden Eagle at, by Walter R. Spofford, 177
- Surfbird, 47
- Surirella biseriata*, 141; *biseriata* var. *bifrons* f. *punctata*, 141; *linearis* var. *constricta*, 141; *linearis* var. *helvetica*, 141; *robusta*, 141; *tenera*, 141
- Surnia ulula*, 88
- Sutton, Richard W.
The Gray Fox, A Manitoba Record, 54
- Swallow, 111; Barn, 11; Cliff, 89; Rough-winged, 89; Tree, 89, 115; Violet-green, 11, 88
- Swan, Trumpeter, 8, 85; Whistling, 67, 100, 113
- Swift, Black, 88
- Sylvilagus*, 54; *floridanus similis*, 177
- Symbolism in Flower Arrangement, reviewed by A. P. Chan, 59
- Symphoricarpos occidentalis*, 164, 167
- Synedra acus*, 141; *acus* var. *angustissima*, 141; *ambicephala* var. *austriaca*, 141; *nana*, 141; *rumpens*, 141; *rumpens* var. *familiaris*, 141; *rumpens* var. *neogena*, 141; *rumpens* var. *scotica*, 141; *ulna*, 141; *ulna* var. *danica*, 141
- Symura uvella*, 139
- Tabellaria fenestrata*, 141; *flocculosa*, 137, 141
- Tachycineta thalassina*, 11, 89
- Tales from the Vienna Woods, reviewed by Ruth Horner Arnold, 133
- Tanager, Scarlet, 115; Western, 92
- Taraxacum officinale*, 98, 159, 173
- Taricha klauberi*, 60; *rivularis*, 60; *torosa*, 60
- Taylor, E. W.
Review of: Investigations of Ring-necked Pheasants in Illinois, 58
- Teal, Green-winged, 29, 30, 45-47, 70, 86, 105, 113
- Telmatodytes palustris*, 90
- Tern, Arctic, 19, 77, 111, 113; Black, 88; Common, 19; Roseate, 19
- Tetrademus elegans*, 138
- Tetradædon minimum*, 138
- Tetraspora cylindrica*, 138; *gelatinosa*, 138; *lacustris*, 138
- Thalictrum venulosum*, 166
- Thammophis butleri*, 204
- Thermopsis rhombifolia*, 172
- Thetidites*, 53
- Thieret, John W.
Grassland vegetation near Fort Providence, Northwest Territories, 161

- Thisbites agricolae*, 53; *charybdis*, 53; *dawsoni*, 53; *pyrami*, 53
Thlaspi arvense, 170, 171
 Thrasher, Brown, 35, 41
 Thrush, Hermit, 40, 41, 90, 115; Olive-backed, 115; Varied, 12, 44, 46, 47, 90, 113; Wood, 115
Thuja plicata, 6, 22
 Titmouse, Tufted, 38
Tolypothrix distorta, 139; *lanata*, 139
Totanus flavipes, 108; *melanoleucus*, 10, 88
 Towhee, Rufous-sided, 12, 32, 34, 35, 40, 41, 44, 46, 47
Tribonema, 139
Trifolium, 158; *hybridum*, 154, 159, 172; *hybridum* forma **allioideum**, 153, 154; *hybridum* L. forma **proliferum**, 150, 154; *pratense*, 153; *repens*, 153, 154, 159, 172; *repens* L. forma **allioideum**, 153, 154; *repens* f. *monstrosum*, 153; *repens* f. *phyllanthum*, 153; *repens* m. *phyllanthum*, 153; *umbellatum*, 153
Triglops, 79
Triglophis thompsoni, 182
Trisetum spicatum, 168
Triticum aestivum, 171
Triturus, 60
Troglodytes troglodytes, 11, 90
Tropites, 53
Tryngites subruficollis, 109
Tsuga heterophylla, 6, 22; *mertensiana*, 6
 Tufts, Robie W.
 Golden Plover in Nova Scotia, 175
Turdus migratorius, 11, 90, 111
 Turnstone, Black 43-45, 47; Ruddy, 76, 108
Typha latifolia, 53
Tyrannus tyrannus, 89

Ulothrix variabilis, 139
 Underhill, J. Edward
 A case of hellebore poisoning, 128
Uria aalge, 20; *lomvia lomvia*, 78
Urocyon cinereoargenteus ocythous, 54

Vaccinium angustifolium var. *laevifolium*, 156, 159; *uliginosum*, 169; *vitis-idaea* var. *minus*, 156, 159
Vallisneria sp., 136

 Variation and Systematic Relationships with-
 in the Salamander Genus *Taricha*, re-
 viewed by S. Bleakney, 60
 Veery, 90, 115
Veratrum eschscholtzii, 128
Vermivora celata, 91; *ruficapilla*, 130
Veronica serpyllifolia, 159
Vespula arenaria, 174; *maculata*, 174
Vicia americana, 164, 166, 172; *americana* var.
 angustifolia, 172; *cracca*, 158, 159
Viola cucullata, 159; *pallens*, 159
Vireo gilvus, 91
 Vireo, Red-eyed, 115; Warbling, 91
Vredenburgites, 53

 Warbler, Audubon's, 91; Black-throated
 Blue, 115; Black-throated Green, 115;
 Blackburnian, 115; Chestnut-sided, 115;
 MacGillivray's, 12, 91; Myrtle, 35, 91;
 Orange-crowned, 91; Wilson's, 92; Yel-
 low, 91, 112
 Waterthrush, Northern, 91
 Waxwing, Bohemian, 34, 35, 39, 40, 42, 43,
 45, 46, 90; Cedar, 12, 32-41, 46, 90, 115
 Wheatear, 80
 Whimbrel, 108, 113
 Whip-poor-will, 115
 Widgeon, American, 8, 41, 44-47, 86, 105,
 113; European, 47
Wilsonia pusilla, 92
 Woodpecker, Black-backed Three-toed, 30,
 34-37, 40, 41, 43; Downy, 13, 30-46, 89,
 115; Hairy, 11, 29-47, 89, 115; Lewis', 45,
 47; Northern Three-toed, 113; Pileated,
 32-47, 89, 115; Red-bellied, 38
 Wren, Bewick's, 44, 46, 47; Carolina, 35, 41;
 House, 115; Long-billed Marsh, 45, 46,
 90; Rock, 111; Winter, 11, 45-47, 90, 115

Xanthocephalus xanthocephalus, 92
Xema sabini, 110; *sabini sabini*, 77

 Yellowlegs, Greater, 10, 44, 88; Lesser, 108
 Yellowthroat, 35, 92; Maryland, 115

Zenaidura macroura, 88
Zonotrichia atricapilla, 93; *albicollis*, 80;
 leucophrys, 12, 92; *leucophrys gameli*, 112;
 leucophrys leucophrys, 80
Zygnuma, 139

A Note on the Production of this Journal

The Canadian Field-Naturalist conforms to recommendations on the layout of periodicals issued by the International Organization for Standardization. It is set by Linotype in Janson. The title is in Kennerley. Boldface headings are Bodoni. Cover stock is 'Mayfair' by Howard Smith and text paper is Provincial Paper 'Thriftcoat.' Printing is by The Runge Press Ltd., Ottawa, Ontario.

AFFILIATED SOCIETIES

British Columbia Bird and Mammal Society

President, M. D. F. UDVARDY, Dept. of Zoology, University of British Columbia, Vancouver 8, B.C.

Edmonton Bird Club

President, PROF. W. R. SALT; *Vice-President*, DR. K. BALL, *Secretary-Treasurer*, W. G. LAWRENCE TWIGGE, 11343 67th St., Edmonton, Alta.; *Field Secretary*, H. C. PEGG; *Audubon Representative*, R. HEATH; *Editor*, E. O. HÖHN; *Librarian*, G. BALL.

Mellwraith Ornithological Club

Past President, DR. W. W. JUDD; *President*, H. A. U. MONRO; *Vice-President*, DR. F. S. COOK; *Recording Secretary*, D. DOW; *Treasurer*, MISS M. MACPHERSON; *Corresponding Secretary*, MRS. M. E. LEAHY, 682 Huron St., London, Ont.; *Migration Secretary*, J. W. LEACH, 376 Platt's Lane, S.S. 3, London, Ont.

Natural History Society of Manitoba

President, DR. J. C. RITCHIE; *Treasurer*, HAROLD MOSSOP; *General Secretary*, E. DOWTON, 47 Cunningham Ave., Winnipeg 8, Manitoba.

Nova Scotia Bird Society

President, DR. HARRISON F. LEWIS; *Vice-President*, C. R. K. ALLEN; *Secretary-Treasurer*, MRS. S. WARD HEMEON, c/o Nova Scotia Museum of Science, Spring Garden Road, Halifax, N.S.; *Editor*, DR. LLOYD B. MACPHERSON.

Provancher Society of Natural History of Canada

President, J. KENNEDY HILL; *First Vice-President*, FRANCOIS HAMEL; *Second Vice-President*, RONALD E. BLAIR; *Secretary-Treasurer*, GEORGES A. LECLERC, 628 Fraser St., Quebec, Que.

Province of Quebec Society for the Protection of Birds

President, C. C. SALT; *Vice-Presidents*, J. DELA-FIELD, MISS R. B. BLANCHARD; *Treasurer*, MISS G. E. HIBBARD; *Secretary*, MISS RUTH S. ABBOTT, 164 Senneville Road, R.R. 1, Ste. Anne de Bellevue, Que.; *Librarian*, MRS. P. H. DU BOULAY.

Toronto Field Naturalists' Club

President, A. A. OUTRAM; *Vice-President*, FRED BODSWORTH; *Secretary-Treasurer*, MRS. HILTON ROBSON, 49 Craighurst Avenue, Toronto 12, Ont.; *Assistant Secretary*, MRS. J. B. STEWART; *Junior T.F.N.C.*, DON BURTON.

Vancouver Natural History Society

Honorary President, N. A. M. MACKENZIE; *Past President*, A. R. WOOTTON; *President*, J. J. PLOMER; *Vice-President*, FRANK SANFORD; *Honorary Secretary*, J. Y. NEILD; *Recording Secretary*, MISS ETHEL FUGLER; *Program Secretary*, JOHN GARDNER; *Honorary Treasurer*, FRANK SANFORD; *Librarian*, MRS. S. F. BRADLEY; *Editor of Bulletin*, C. B. W. ROGERS.

ADVICE TO CONTRIBUTORS

Manuscripts

Manuscripts should be typewritten on one side of nontransparent paper measuring 8½ by 11 inches. Authors are requested to use at least one given name. All text matter, including quotations, footnotes, tables, literature references, and legends for figures should be double-spaced. Only those words meant to appear in italics should be underlined. Every sheet of the manuscript should be numbered.

Webster's New International Dictionary is the authority for spelling.

References are made by the author-date system. They should be listed alphabetically and typed at the end of the main body of text. For titles in reference matter, abbreviations follow the rules in the *International Code for the Abbreviation of Titles of Periodicals* and the *World List of Scientific Periodicals*.

Other abbreviations should be used sparingly. The better-known terms of measurement follow CSA Specification Z85-1943 *Abbreviations for Scientific and Engineering Terms* or the equivalent of the American Standards Association (Z10.1-1941).

Tables should be titled and numbered consecutively in arabic numerals. Tables and legends for the figures should be placed after the list of references. Each table and all the legends should be on separate pages.

Notes should bear the name of one author only

and references in notes should be incorporated directly in the text.

Illustrations

All figures, including each figure of the plates, should be numbered consecutively in arabic numerals. The author's name, title of the paper, and figure number should be written in the lower left corner of the sheet on which the illustration appears. The legend should not be incorporated in the figure.

Line drawings should be made with India ink on white drawing paper, blue tracing linen, or blue-lined co-ordinate paper. Co-ordinate lines that are to appear in the reproduction should be ruled in black ink. Descriptive matter should be lettered, not typewritten, and all parts of the drawing should permit easy legibility even if a reduction is made.

Photographs should have a glossy finish and show sharp contrasts. For reproduction as a complete plate they should be mounted without space between prints.

For large drawings and mounted photographs the ratio of height to width should conform to that of the journal page (4½ by 7½ inches) but the height should be adjusted to allow for the legend.

Reprints

Reprints, with or without covers, may be bought. The cost is given on the reprint order form which is attached to the galley proofs.

CHRISTMAS BIRD CENSUS — 1959

Reports should be returned by January 11, 1960. Submission forms are automatically sent to past participants. Others may obtain forms by writing, without delay, to: Mr. W. Earl Godfrey, National Museum of Canada, Ottawa, Ontario.

A NOTICE FOR ROTIFER STUDENTS

Students of the Rotifera, and those who use rotifers as experimental animals, may obtain a free copy of
Second Preliminary List of the World's Rotifer Students

by writing to

Dr. John J. Gallagher
1716 East Terry Street
Pocatello, Idaho

Date Due

NOV 80

ERNST MAYR LIBRARY



3 2044 114 198 096



